A FAWCETT PUBLICATION

APRIL 25c
IN CANADA 30c

MODERN MECHANICS AND INVENTIONS

FLYING WITHOUT LEAVING THE GROUND
SEE PAGE 83

WHERE TELEVISION STANDS TODAY

By DAVID SARNOFF of the RADIO CORPORATION

PYROIL

Brings Greater

SAFETY TO FLYING

In a recent rigid test of PYROIL, engineers of **Curtiss-Wright Flying Service**—(the **"World's Oldest Flying Organization"**)—signed a report certifying that:

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President

W. V. KIDDER, President

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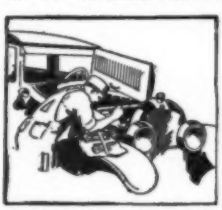

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Special training in Talking Movies, Television and home Television experiments, Radio's use in Aviation, Servicing and Merchandising Sets, Broadcasting, Commercial and Ship Stations are included. I am so sure that N.R.I. can train you satisfactorily that I will agree in writing to refund every penny of your tuition if you are not satisfied with my Lessons and Instruction Service upon completion.

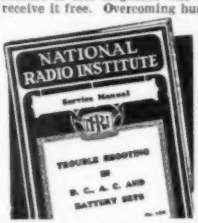
64-page book of information FREE

Get your copy today. It tells you where Radio's good jobs are, what they pay, tells you about my course, what others who have taken it are doing and making. Find out what Radio offers you without the slightest obligation. ACT NOW!

J. E. SMITH, President
National Radio Institute, Dept. 2DH
Washington, D. C.

Special Free Offer

Act now and receive in addition to my big free book "Rich Rewards in Radio," this Service Manual on D.C., A.C. and Battery Operated sets. Only my students could have this book in the past. Now readers of this magazine who mail the coupon will receive it free. Overcoming hum, noises of all kinds, fading signals, broad tuning, howls and oscillations, poor distance reception, distorted or muffled signals, poor Audio and Radio Frequency amplification and other vital service information is contained in it. Get a free copy by mailing the coupon below. ACT NOW.



I have doubled and tripled the salaries of many

Find out about this tested way to BIGGER PAY

Get a Job with a Future

FILL OUT AND MAIL THIS COUPON TODAY

J. E. SMITH, President
National Radio Institute, Dept. 2DH
Washington, D. C.

Dear Mr. Smith: I want to take advantage of your Special Offer. Send me your two books "Trouble Shooting in D.C., A.C. and Battery Sets" and "Rich Rewards in Radio." I understand this does not obligate me and that no salesman will call.

NAME .....

ADDRESS .....

CITY .....STATE..... "M"

Lifetime Employment Service to all Graduates

The outboard cruiser Allegra constructed by Moro school boys from plans published in the May, 1930, issue of M.M. The work was done under the direction of K. W. Chapman as manual training project in the public schools of Jolo, P. I.

Andy's Shop Mail Box

Hail, Hail, the gang's all here! If you've never met the Double M hangar gang, just barge in below and see what they're up to. Andy, the chief gangster, again brings you a load of gossip from the boys.

THE Chief of Staff tells me that my space has been reduced by a couple of columns this month, and as the mail has been accumulating quite some lately, I'm going to put my own special brand of baloney on ice and dish you up an assortment provided by the gang.

First let's take a look at that highway hurdler down in the corner. Now let's see what the builder has to say about it:

Barrett Loning at the wheel of his home-made car which cost only $17.00 and gets 50 per from a motorcycle motor.

Hot Springs, Va.

Dear Sir:

Enclosed is a snapshot of my home-made auto which cost me $17.00, including a used motorcycle motor.

Note the way the motor is set in the frame, which permits a drive shaft to be used instead of a chain. It will do about fifty per. Not so bad for an 18-year-old boy. Think so?

BARRETT LONING.

Mighty sweet, I'd say. That bus might be classed under the head of cheap transportation if I were in the mood for classing busses, which of course I am not.

And while on the subject of home-made road lice, let's stay on the subject long enough to get a couple more letters out of my overflowing mail box. Exhibit A:

Green Acres,
Roxbury, Conn.

Andy'th Thop Mail Bokth,
Hello you old ball bearing thlinger:

Thay you, now that you haf been tawking tho muth about home bilt autoth, how about giving uth thom planth to go by when we

(Continued on page 12)

You, too, can be an Author!

and you don't have to write a thing except your signature

Here's how—

IMAGINE the surprise of your friends to discover a book with your name as author, right there on your library table! And then picture their astonishment when, upon opening the volume, they find the leaves glued together, and the center cut out to make room for a flask, cigarettes, candy, or what have you!

Become a literary lion today—simply decide upon the title of your own book and we do the rest. The books are handsomely bound and the titles, with your name below as author, are stamped in gold leaf. No expense has been spared to make them worthy of a place in your library. Our patent method of fastening the pages makes the book absolutely real—until the fly leaf is lifted to betray the secret.

THE EYE OPENER—red grained fabrikoid de luxe binding, with flask in receptacle. A best cellar.

LADY NICOTINE'S LOVERS—smoke gray fabrikoid de luxe binding, with receptacle for cigarettes or cigars.

AMONG MY SOUVENIRS — light gray fabrikoid de luxe binding. Order one for her, with her name as author, and use it as a novel carrier for your gift of jewelry, etc.

MY CANDY BOX—green fabrikoid, suitable for candy container. Put her name on as author.

The cost of becoming an author, in keeping with these times, is most reasonable; two dollars for the de luxe bindings; three dollars for morocco leather. Add one dollar if you make up your own book title. Your choice of titles shown in box at left, at two dollars each, with gold leaf title and name.

600 SEXTON BUILDING **MAYHEW PRINTING COMPANY** MINNEAPOLIS MINNESOTA

MAYHEW PRINTING COMPANY, 600 Sexton Bldg., Minneapolis, Minn.

I enclose $..... Please send me postpaid, the following order, with the understanding that I will return books postpaid within five days if not satisfied. (Print Name of Author.)

.....copies of **The Eye Opener**, by.....

.....copies of **Lady Nicotine's Lovers**, by .....

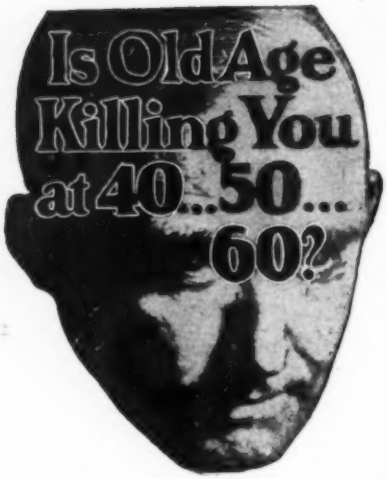
.....copies of **Among My Souvenirs**, by.....

.....copies of **My Candy Box**, by.....

Signed .....

Address .....

AGENTS WANTED — WRITE FOR PARTICULARS



Are you aging too soon . . . getting up 5 to 10 times at night . . . is vitality ebbing steadily away . . . are you definitely on the down grade, half-living, blue, depressed, subject to chronic constipation, chronic fatigue, backache, foot and leg pains? Then look to the vital prostate gland!

New Facts About the Prostate Gland!

In men past 40, do you know that these symptoms are often the direct result of prostate gland failure? Are you aware that these symptoms frequently warn of the most critical period of a man's life, and that prostate trouble unchecked usually goes from bad to worse . . . that it frequently leads to years of fruitless treatment and even surgery . . . that it even threatens life itself?

FREE to Men Past 40

No man past 40 should go on blindly blaming old age for these distressing conditions. Know the true meaning of these symptoms. Send for a new, illustrated booklet, "The Destroyer of Male Health," written by a well-known American Scientist, and see if these facts apply to you.

There is little or nothing that medicine can do for the prostate gland. Massage is annoying, expensive and not always effective. Now this scientist has perfected a totally different kind of treatment that you can use in your own home. It employs no drugs, medicine, or violet rays. It stimulates the vital prostate gland in a new natural way, and it is as harmless as brushing your hair. 100,000 men have used it with remarkable results.

Swift Natural Relief

Now physicians and surgeons in every part of the country are recommending this non-medical treatment. So directly does this new safe treatment go to the prostate gland that noticeable relief often follows overnight. So remarkable are the results that you can test it under a guarantee that unless you feel 10 years younger in 7 days you pay nothing.

Scientist's Book Free

Send now for this Scientist's free book and learn these new facts about the prostate gland and old age ailments.

Simply mail the coupon to W. J. Kirk, president, 3852 Morris Ave., Steubenville, Ohio.

If you live west of the Rockies, address The Electro Thermal Co., 383 Van Nuys Building, Dept. 38-F, Los Angeles, Calif. In Canada, address The Electro Thermal Co., Desk 38-F, 53 Yonge St., Toronto, Ont., Can.

W. J. Kirk, Pres., 3852 Morris Ave., Steubenville, Ohio.

Without obligation, kindly send me a free copy of "The Destroyer of Male Health."

Name .....

Address .....

City ..... State.....

ANDY'S SHOP MAIL BOX

(Continued from page 10)

make ourth. Or better yet, gif uth a how to bild article and altho put thum building hinth on how to mount the motor, etc. And pleath don't make it a rather body becauth you can't make thpeed with a wathing mathine motor, whith I would be glad to thee in an article perty thoon.

And another thing. Lay off the light plane building for a while. Any horth would know that two (2) planth a year ith enough for any bunth o' light plane bugth to worry over. And don't tell me that thum people don't like the thame plane otherth would, becauth if you were anywhere near the horth senth clath, which I'll let you know you ain't, you would publith planth for a plane that would have the linth that every one would like and then wouldn't have to publith about thixty eleven theth of planth.

Now will you lay off the light planth and give uth home car builderth thomthing to think about. If not I'll be glad to let you name the plath, time and weaponth.

Yourth for bigger (I mean Smaller) and better home built cars.

TEDDY MURKLAND.

Whoops, it lithpth!

Dawgonit, now you've went and got me doing it too. Why didn't you double-space your letter so I wouldn't have had to wear out my th's on this machine, fixing it up so the printer could read it? You've got me now so that every time I reach for an S on thith old Woodstock (free ad) I grab a handful of th's. Thomething ought to be done

And as for plans for midget cars, how about you prize winners sending in those drawings? We're still waiting for the first and second prize cars, and have only just received the plans for that pint-sized flivver that copped third money.

And as for you and your challenge, Teddy, I hope the eds don't publish those plans now, because ever since Charley Fox, the wrestler, got a headlock on my dome and made it look like the leaning tower of Pisa, I've had a hankering to tangle with somebody easy, like a guy who lisps. Of course, if you only talked that way it wouldn't be so bad, when a guy puts baby talk on paper it seems a bit too much like waving a silk hanky, if you get the idea.

Evidently Teddy isn't the only one worrying about those plans for the prize-winning cars. Read this:

106 Mill St.,
Susanville, Calif.

Dear Andy:

I thought the eds promised us a few plans on those midget chug-chugs. I'm interested in the first prize winner. In fact, I expect to build it—with a few modifications. Kindly give the eds a razzing for me as I'm getting anxious.

I've been reading your mag for quite a while and I think it's great. (I agree with Walt Johnson.)

(Continued on page 14)

"What's it to be, Son—just flying, or the AVIATION BUSINESS?"

"FLYING is both a sport and a job. But you've got to think about what you're going to make of your life. You've got to prepare yourself for a *business* . . . an objective toward which you can work with confidence that you've got a lifetime career ahead of you.

"I think Aviation offers you what you want. I think you've got the qualities it demands. But you've got to realize that the biggest part of Aviation is *business* . . . just as it is in any other form of transportation. If you can find an aviation school that prepares you for business as well as flying . . . go to it."

How many fathers are saying that to their sons today? How many young men have realized it for themselves? So many, indeed, that we recognize the demand for business training in Aviation . . . and on April 4th PARKS AIR COLLEGE will inaugurate the first class in its

28-WEEK *Executive* AVIATION COURSE

(The Business-Training Section of our Executive Transport Pilot's Course)

IT is distinctly a course for the man who realizes that this generation will see transportation's greatest development in the air . . . and who is determined to play his part worthily in that triumph. It is a course for the man who now has, or plans to get later, his Transport Pilot's license.

The theme of the course is the application of flying to business and of business methods to aviation. In 28 weeks of intensive work it covers Air Transport Operation, Operations Management, Personnel Selection, Economics of Air Line Location, Airport Design and Management, Advanced Aeronautical Meteorology, Public Speaking, Engineering Drawing of Airplane Structure, Advanced Navigation of Aircraft, Salesmanship, Sales Promotion, Advertising, Aircraft Radio Equipment.

Enrollments for the April 4th class will close shortly. Full information about the course is at your disposal . . . the coupon will bring it.

You are invited to visit and inspect **PARKS AIR COLLEGE**

PARKS AIR COLLEGE

WORLD'S LARGEST COMMERCIAL FLYING SCHOOL

Section 4-MM
East St. Louis, Illinois.

If you cannot come to the school, this book will tell you much about PARKS standards and methods. It describes all our courses in detail, with many illustrations. Sent on request.

MAIL THIS COUPON

Send me "Skyward Ho!", with information about the course checked, for a young man of_____
Age

- ☐ Executive Aviation Course (28 weeks)
- ☐ Executive Transport Pilots' Course (2 years)
- ☐ Other Flight and Mechanics Courses

Name _____

Address _____

City _____ State _____

STOPPING LEAKS
WHERE THE METAL IS THIN

THIS is the easiest kind of a Smooth-On repair to make and anyone can get good results.

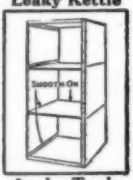
Merely mix the Smooth-On with water until it forms a putty. If the leak is at a seam, pry open a little, clean off, and force the Smooth-On in with the finger or a knife blade. At a rusted spot, scrape off the rust, force the Smooth-On through and press it to anchor on both sides. At small holes, put the Smooth-On between washers inside and out and use a small machine screw and nut for drawing up tight.

Smooth-On No. 1 forced into seam openings, between rivets, or into the holes quickly metallizes and thereafter is tight against hot or cold water, steam, smoke, oil, gasoline, gas, etc. It holds in any metal and can be used as well to stop leaks at joints and cracks in cast or wrought metal pipes, radiators, boilers, and furnaces. Use it also to tighten loose handles and to anchor loose bolts, screws, etc., in metal, concrete, tile and wood.

Radiator

Leaky Pail

Leaky Kettle


Leaky Tank

Stove Pipe

Oil Leaks

By following the simple directions in the Smooth-On Repair Booklet, you can make dozens of home and automobile repairs at a very small fraction of what a repair man would charge, and if you keep a small can of Smooth-On ready for emergencies, you also avoid annoying delays.

Write for **FREE BOOK**

Get Smooth-On No. 1 in 7 oz., 1-lb. or 5-lb. tins at nearest hardware store or if necessary direct from us.

Do it with SMOOTH-ON

SMOOTH-ON MFG. CO., Dept. 69,
574 Communipaw Ave., Jersey City, N. J.
Please send the free Smooth-On Repair Book.

Name .....

Address .....

4-32 .....

ANDY'S SHOP MAIL BOX

(Continued from page 12)

If Walt Pratt is listening (congratulations), I'd like to hear from him.

Your colum's great,
PHIL BROWNALL.

Thanks a lot, Phil. Now will you prize winners get busy and give us plans for those cars, or will I have to show you another letter? Oh, well, here goes:

16 Normandy St.,
Windsor, S. 1.,
Victoria, Australia

Dear Andy:

I have been a reader of your magazine for quite a while now, and I can safely say that I cannot find fault with it in any way. I have read the criticisms and letters published from time to time in the Mail Box, and I think you ought not to publish letters criticising your mag.

I am interested in small cars mostly, and can assure you that I was more than pleased to read about your light car contest. Some of those cars, if they were here, would be rushed by our young fellows.

As you know, where there are cars and motorbikes there are always used spare parts, etc. We have quite a number of auto wreckers in Melbourne, so I am looking forward to seeing some of those plans in your mag in 1932.

Yours truly,
RON. J. RENDALL

Ah there, Digger, I'm glad to admit you as charter member of the Down Under Chapter of the Gang. Just keep reading Double M. Sooner or later you'll find plans for just what you want, and I have an idea that what you want will come sooner.

DISSATISFIED CUSTOMER DEPARTMENT

602 Essex St.,
Fort Worth, Texas.

Dear Andy:

Since reading the December issue of M. M. I cannot refrain longer from voicing my opinion of the birds that judge the different contests, namely, the home built airplane and cycle car contests.

When I saw the picture of the winning airplane, several months ago, I nearly had convulsions, and now look what has been picked for a winner in the cycle car contest.

Not that I am trying to belittle the efforts of the builders that won in the contests; but man, look at the real jobs that were also submitted.

Get this part straight! I did not enter either contest, so I am not mad because I didn't win; but please tell me how these supposed judges arrived at a decision. Is it a frame up?

What incentive is there for anyone to enter your contest that has real ability? I am not alone in wondering about this, as all of the gang are talking about it.

In view of the real ships and cycle cars

(Continued on page 16)

LEARN RADIO
BY PRACTICAL SHOP WORK IN
LOS ANGELES

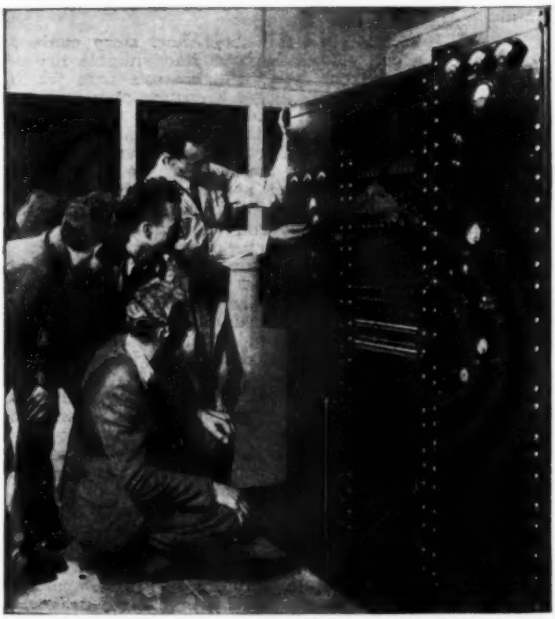
Come to National in sunny California and learn all branches of Radio in 4 happy months—Service Work, Broadcasting, Television, Talking Pictures and Code Practice. No correspondence! All practical shop work in the oldest and largest Trade School of the West. Prepare now for the good jobs constantly opening up in the great Radio, Television and Talking Picture Fields!

This student is getting actual experience before the "mike" in our own sound proof Studio Room.

RAILROAD FARE ALLOWED

Don't worry about the expense of trip. For a limited time we are making a Special Free Railroad Offer to Los Angeles. This is deducted from your tuition, so the trip costs you nothing extra. Take advantage of this opportunity to visit Los Angeles and Hollywood and prepare for a good job at the same time!

TELEVISION AND TALKING PICTURES



Here the Instructor is explaining the Input equipment of our 50-watt, crystal-controlled, Broadcasting Transmitter.

Eight stations are already sending out regular Television programs! 10,000 Theaters are equipped for sound and yet the job is only half done. 600 Broadcasting Stations are employing trained Operators and Mechanics. 10,000,000 radio sets must be constantly serviced and repaired. New jobs are always opening up—scores of golden oportunities for the Trained Man!

FREE EMPLOYMENT SERVICE
Spare Time Jobs While at School

If you are short of money, we will gladly help you get part-time work while at school, to pay your room and board. Fully 70 percent of our students pay their living expenses that way. Then when you graduate we'll render you every assistance in getting just the job you want. National has been training fellows like you for 27 years. Let National train you for an interesting, good-paying Radio Job! Mail the coupon below for full details and a Free Copy of our big Television, Talking Picture and Radio Book. No cost or obligation. Just mail the coupon!

NATIONAL TELEVISION, TALKING PICTURE and RADIO SCHOOL
4006 So. Figueroa St., Dept. 43E, Los Angeles

National Television, Talking Picture and Radio School,
Dept. 43E, 4006 So. Figueroa St.,
Los Angeles, Calif.

Please send me your big new Free Book on Television, Talking Pictures and Radio, and full details of your Free Railroad Fare offer.

Name.....

Street No.....

City.....State.....

HEATH STILL LEADS

Again Heath demonstrates why it is America's most popular Sport Plane. Performance—Safety—Economy—have always been Heath Qualities and now is added the quality of

EASY OWNERSHIP

FLYING is the greatest sport known—why not enjoy it? You can buy your Heath, less motor, for only $499.00, ready to assemble and cover. Finished parts supplied include welded fuselage, welded tail group, welded ailerons, controls, landing gear, etc. Can be completely assembled at home in a few weeks' time.

Or start from progressive groups of parts. First group, $20.00, including set of 28 factory made ribs. You don't have to be a mechanic to build your Heath under this system.

Heath Model LN is approved by the United States Department of Commerce, and home assembled Heath LN models are eligible for Federal License, A. T. C. No. 456.

You can fly your Heath anywhere, safely and economically, and you can pay for it as you fly.

Fill out the attached coupon and send it with 15c for descriptive matter and information about our partial payment plan. Special club offers.

HEATH AIRCRAFT CORPORATION

Dept. M-24 NILES, MICH.

Heath, Model LN, fly-away $1074
K. D. Airplane, less motor $499
Heath B-4 engine $300

HEATH AIRCRAFT CORP.,
Dept. M-24, Niles, Mich.
Send me more information about the new Heath ☐ fly-away ☐ assembly plan. I am interested in
☐ partial payment plan
☐ special club offer
Name .....
Address .....
City .....

ANDY'S SHOP MAIL BOX

(Continued from page 14)

that did not win, please let us know what (if anything) does the contest mean anyway. How are they judged? By whom?
E. K. CHAFFIN.

IF A magazine attempted to answer all the squawks after staging a contest it would have to move into the Empire State Building to make room for the stenographers and those who dictate to them. This letter is picked as typical and will get a reply right here and now.

Starting with the last question, I was chief judge in both of these contests. Although the final decision was not up to me, I sorted the possibilities from the impossibilities. Those thrown out by me as impossible received no further consideration. Then members of the staff of this magazine voted to decide the winners, discussing the various angles of each possibility as it was picked from the pile. The winner is the one which receives the most votes.

"What does the contest mean?" you ask.

What do you think? Are you one of those simple souls that think a magazine stages a contest because it has too much money and wants to give some away? If so, just forget it.

TWO KINDS OF CONTESTS

Magazine and newspaper contests fall into two classes. One class is strictly an attempt to increase the circulation. Into this class falls limericks, cross-word puzzles, cut-outs.

The other class of contest is staged when the editors want something, can't get it from regular contributors, and decide to look to their readers for it.

Into this class fall short-short story contests by which editors hope to find suitable manuscripts of that type; title contests with which the editors hope to get a snappy new title for a magazine; and light plane and midget auto contests with which the editors hope to dig up some plans for which there has been a demand.

If you had read the rules of the contest you might have arrived at some such conclusion yourself. In the case of both of the contests in question, low cost and ease of building from readily obtainable materials was stressed.

Since we were looking for plans, we stated that originality would count. Of course we didn't care to run plans for the Heath Parasol again, having published them once. The same applied to our other old standbys. These planes, however, predominated in the light plane contest.

I still believe that the three winners we picked were the best original planes entered in the contest. In fact I will go so far as to say that Heinemann's plane, which won second prize, was the best entry of the whole bunch. The other judges overruled me on this point, and they are entitled to their opinions.

Wilson Miller's plane, which won first prize, was highly original, was cheap to build (less than $300), and pictures were submitted showing that it could actually fly (an important point). Miller also submitted enough drawings to show that the construction was sound and

(Continued on page 20)

Don't say "learning music is hard"

...until you've sent for our FREE demonstration lesson

TIME and again you've wanted to learn to play your favorite instrument; you've longed to get your share of the popularity and personal pleasure that every good musician enjoys—to know the thrill that comes with being able to entertain *musically.*

Yet, so far, you've been "scared" to start.

Why? Is it because you're under the impression that learning music necessitates long years of uninteresting study—lesson after lesson crammed with dry-as-dust theory and endless practicing? Has somebody told you that you need special talent to become a musician?

Then you're in for the surprise of your life. For, now, thanks to the famous U. S. School of Music, the reading and playing of music has been made so downright simple that you don't have to know one note from another to begin.

Easy As Can Be

The lessons come to you by mail. They consist of complete printed instructions, diagrams and all the music you need. Compulsory practice? No. You study only when you feel like it. Personal teacher? No. If you make a mistake you correct it *yourself* and continue. Monotonous scales and harsh-sounding finger exercises? Never. From the very first lesson on you are playing real tunes by note. It's as easy as A-B-C. For before you strike a note, you are told how a thing is done. Then a picture shows you how. Then you do it yourself and hear it. Little theory. Plenty of accomplishment.

PICK YOUR INSTRUMENT

Piano	Violin
Organ	Clarinet
Ukulele	Flute
Cornet	Saxophone
Trombone	Harp
Piccolo	Mandolin
Guitar	'Cello

Hawaiian Steel Guitar
Sight Singing
Piano Accordion
Italian and German Accordion
Voice and Speech Culture
Harmony and Composition
Drums and Traps
Automatic Finger Control
Banjo (Plectrum, 5-String or Tenor)
Juniors' Piano Course

A few short months pass quickly by. Almost before you realize it, you are playing selections that fit your mood—you are entertaining others with wonderful classical compositions . . . lighter airs and ballads of haunting beauty . . . dance music that thrills with the fascination of jazz. No wonder that this remarkable method has been vouched for by over 600,000 people from all parts of the world.

Bear in mind no matter which instrument you select—the cost of learning in each case will average the same—just a few cents a day!

Get Proof Free!

Don't let a lot of false impressions and silly bugaboos delay your start toward musical good times. If you really want to learn to play—if social popularity and increased income appeal to you—then reserve your decision until we send you a Free Demonstration Lesson and a copy of our free illustrated book which describes in detail the famous U. S. School print-and-picture method. Then it's entirely up to you. You're the judge and jury. No obligation involved, of course.

When writing, kindly mention your favorite instrument. Forget that old-fashioned idea that you need talent to learn music and fill in and mail the coupon now. Instruments supplied when needed, cash or credit. U. S. School of Music, 2624 Brunswick Bldg., New York City.

Thirty-fourth Year (Established 1898)

U. S. SCHOOL OF MUSIC
2624 Brunswick Building, New York City

Please send me your free book, "How You Can Master Music in Your Own Home," with introduction by Dr. Frank Crane, Free Demonstration Lesson and particulars of your easy payment plan. I am interested in the following course:

Have You ..... Instrument? .....

Name .....

Address .....

City ..... State.....

PATE

Protect Your Ideas

Take the First Step Today

If you have a useful, practical, novel idea for any new article or for an improvement on an old one, you should communicate with a competent Registered Patent Attorney AT ONCE. Every year thousands of applications for patents are filed in the U. S. Patent Office. Frequently two or more applications are made for the same or substantially the same idea (even though the inventors may live in different sections of the country and be entirely unknown to one another). In such a case, the burden of proof rests upon the last application filed. Delays of even a few days in filing the application sometimes mean the loss of a patent. So lose no time. Get in touch with me at once by mailing the coupon on the opposite page.

Prompt, Careful, Efficient Service

This large, experienced organization devotes its entire time and attention to patent and trade mark cases. Our offices are but one block and a half from the U. S. Patent Office. We understand the technicalities of patent law. We know the rules and requirements of the Patent Office. We can proceed in the quickest, safest and best ways in preparing an application for a patent covering your idea. Our success has been built on the strength of careful, efficient, satisfactory service to inventors and trademark owners located in every state in the Union.

NO CHARGE for Information

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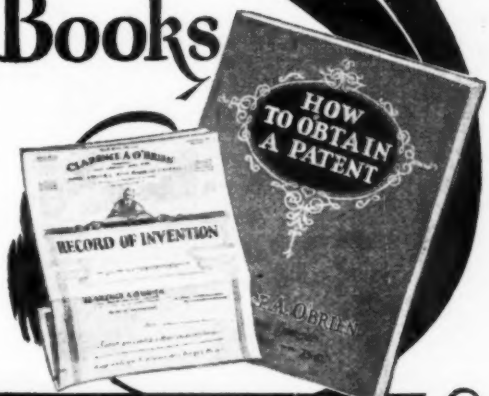

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ANDY'S SHOP MAIL BOX

(Continued from page 16)

that he was capable of giving the rest of the gang the benefit of his experiments in flying with a motorcycle motor. In other words, he gave us just what we wanted.

Naturally his entry would win over a mere photo of an airplane, no matter how much better looking that plane might be. Miller proved he built his plane himself and that it would fly.

The fact that Mr. Miller has not as yet furnished us with the plans we hoped to get is merely unfortunate and in no way reflects on the judges, who awarded the prize to the man they thought had given them what they wanted.

The same more or less applies to the midget car contest. Many of the cars were better looking than the prize winners, but they also cost a lot more. The rules plainly stated that a low construction price would count. Remember, we were also looking for suitable plans for our readers when we announced this contest.

Since we find the majority of our readers among the amateur builders, rather than the men with the costly and completely furnished machine shops, we were much more interested in getting something that could be constructed cheaply than we were in awarding a check to a master craftsman. The jobs submitted by Borntraeger, Waldrip, and Flynt were certainly the work of professionals, while Don Arlen has admitted that he is an A. A. A. driver. Sure, they built sweet jobs, but how many of our readers have the money to put into such cars as this? Those who have, and who want plans of Borntraeger's or Arlen's cars, may buy blueprints directly from them.

And just as soon as Walt Pratt and John Hopkins come across with those drawings they promised, Double M will give you some midget cars that are within your means.

FOR AERONUTS ONLY

NOW that I have that editorial out of my system I'll try to let the rest of the gang spout for a while.

This Lincoln biplane, built by Sgt. Albert Lessard of Randolph Field, Texas, from plans published in the Flying Manual, is powered with an originally converted Lawrence.

Randolph Field, Texas.

Dear Sir:

A friend of mine here has built a Lincoln Sport plane and has powered it with a two-throw Lawrence of his own conversion. I have been helping him with the plane and

(Continued on page 24)

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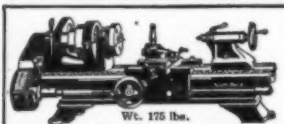

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Reserve territory for me. Please send me at once, without obligation, full facts about salesmen's proposition.

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ANDY'S SHOP MAIL BOX

(Continued from page 20)

it has been very interesting. The plane has been tested and has proven a success.

I am building a plane of my own design, using a Lawrence conversion. The wing will be a Clark Y section with a 32 ft. span and 5 ft. chord. The fuselage is of four longerons to the rear of the cockpit, and three from there back. I am building it in spare time, and hope to have some photos in the future.

Sincerely yours,
VAL S. BANES.

I'll be looking for the pics, Val.

A home-built parasol monoplane constructed by the members of the Clemson College (S. C.) Aero Club. It has a Thomas Morse Scout wing and is powered with a Lawrence motor.

ONE FROM WAIKIKI

959 Prospect St., Honolulu, T. H.

Dear Sir:

I have been watching Andy's Shop column for some time with much interest, especially letters and pictures of home made airplanes, some of which looked very good and some that could stand much improvement.

I have finally decided to let you and the fans see what the first and only successful

(Continued on page 28)

Delays May Be Costly
PATENT
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Mail the coupon today, and in addition to the free book, we'll send you without charge a Record of Invention Blank. This form, when properly filled out may be of value to you as evidence should occasion require it. There is no charge or obligation for this service. Mail the coupon NOW.

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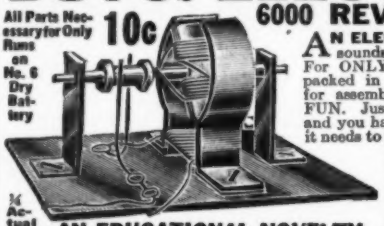
BOYS! ELECTRIC MOTOR 10c

All Parts Necessary for Only 10c Runs on No. 6 Dry Battery



¼ Actual Size

6000 REVOLUTIONS PER MINUTE

AN ELECTRIC MOTOR FOR ONLY 10 CENTS. It sounds almost unbelievable but it is perfectly true. For ONLY 10 cents we send you all the parts necessary packed in a neat box, together with full printed and illustrated directions for assembling. No trouble at all putting the parts together, in fact it is FUN. Just follow a few simple instructions—it takes only a few moments—and you have your motor all ready to run. And OH BOY! Isn't it speedy! All it needs to run it is a No. 6 or similar dry battery. As to the fun you will get out of it, you won't have this motor an hour before you have it running and performing many novel and interesting experiments—has more power than you'd think. Besides, assembling the parts is an education in itself for any boy. Send **10c** (with 5c extra for postage and packing) in any convenient form—stamps will do—and the motor will be sent you at once. Nothing more to pay—nothing more to buy.

AN EDUCATIONAL NOVELTY

JOHNSON SMITH & CO., Dept. 990, RACINE, WIS.

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A Real Telephone. Works Indoors or Outdoors. 100 ft. or 1000 ft.

Though this is merely a very clever toy, it is quite as serviceable for short distances as the most elaborate apparatus made and it is much less liable to get out of order or to need adjustment; in fact it cannot be rendered inefficient unless roughly handled. No troublesome battery, no intricate "hook-up." Can be put to practical use from one room to another, up or down stairs, around corners, etc. The patented sounding disc transmit and receive the voice perfectly, making it a really practical talking telephone. Set consists of two phones, transmission cord and full instructions.

PRICE ONLY 65c per set postpaid. JOHNSON SMITH & CO.

MIDGET BIBLE

GREAT CURIOSITY Smallest Bible in the World. Size of a postage stamp. 200 Pages. Good to bring good luck to the owner. A genuine work of art. Must be seen to be appreciated. Make good money selling them to friends, church acquaintances, etc. PRICE 15c each, 3 for 40c, 12 for $1.35, 100 for $7.50. Also obtainable in Leather Binding, with gold edges. **Price 50c each, 3 for $1.25, $4.50 per doz. Magnifying Glass for use with Midget Bible 15c**

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Box contains 12 eggs. When lit with a match, each one gradually hatches itself into a snake several feet long, which coils and twists about in a most life-like manner. **Price per box, 10c postpaid. 3 for 25c**

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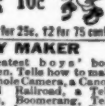

More fun than fighting with your wife. Look just like ordinary matches. As the victim tries to light one he gets quite a surprise. **10c**

Price 10c per box, 3 boxes for 25c, 12 for 75 cents.

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Greatest boys' book written. Tells how to make a Pinhole Camera, a Canoe, model Railroad, a Telephone, Boomerang, Telegraph Instrument, Box Kite, Talking Machine, Microscope, Electric Motor, Electric Door Bell, Water Wheel, Paddle Raft, a pair of Skis, a Dog Sled, Bird House, Rabbit Yard, etc. 64 pages. 150 illustrations. **PRICE 10c.**

BOY'S OWN TOYMAKER. A new book. Tells how to make electric toys, electrical toys, galvanic toys, mechanical toys, paper toys, cardboard toys, boats, traps, etc. 200 illustrations. **Price 25c postpaid.**

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Withabunch of these bills, it is easy for each person of limited means to appear prosperous by flashing a roll of these bills at the proper time and peeling off a genuine bill or two from the outside of the roll, the effect created will be found to be all that can be desired. **Prices, postpaid: 40 Bills 20c, 120 for 50c, or $3.50 thousand postpaid.**

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50 novel and unique experiments in **MAGNETISM** that you can perform with the aid of an ordinary magnet; magnetic chain, fleeing and repinning needle, nail and ball cluster, magnetic fish, top, motor, magnetic billiard balls, many other stunts. Also interesting information about lodestone, magnetism, electricity, etc. **10c p.p.d.**

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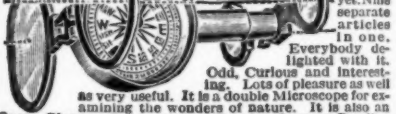
LOOK 35¢ LOOK Wonderful instrument.



Greatest thing yet. Nine separate articles in one. Everybody delighted with it. Odd, Curious and interesting. Lots of pleasure as well as very useful. It is a double Microscope for examining the wonders of nature. It is also an Opera Glass, a Stereoscope, a Burning Lens, a Reading Glass, a Telescope, a Compass, a pocket Mirror, and a Laryngoscope—for examining eye, ear, nose and throat. It is worth all the cost to locate even one painful cinder in the eye. Folds flat and fits the pocket. Something great—you need one. Don't miss it. Sent by mail. **Only 35c or 3 for $1.00.**

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It looks like a deadly weapon, but it is merely a novel Cigarette Case. This clever contrivance has proved itself better than the real thing in many an awkward encounter. Great fun "sticking up" your friends. They squirm and protest it might be loaded. Pull the trigger and the slide flies open disclosing the cigarettes. Well made, light and compact. Weight only 2 ounces.

Send at once and have all the Fun before everybody has one

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Post Paid **10c**

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JOHNSON SMITH & CO.

WONDERFUL X-RAY TUBE

A wonderful little instrument producing optical illusions both surprising and startling. With it you can see what is apparently the bones of your fingers, the lead in a lead pencil, the interior organs in a live steer, and many other similar illusions. Price 10c, 3 for 25c.

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EXAMINE GERMS IN WATER, CHEESE, SUGAR, ETC.

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Into a trunk, under the bed, under a table, back of the door, into a desk at school, or anywhere. You get lots of fun fooling the teacher, policemen, peddlers, and surprise and fool all your friends besides.

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is a little instrument that fits in the mouth out of sight. Cannot be detected. It is used in connection with the above, and with the aid of this wonderful **DOUBLE THROAT, or VENTRILO,** you can imitate many kinds of birds, animals, etc. Remember you get everything for **ONLY TEN CENTS**—a booklet giving you full instructions how to become a ventriloquist and throw your voice, the **Double Throat, or Ventrilo,** and our big page catalog of novelties, tricks, puzzles, jokes, books, etc., **ALL SENT POSTPAID TO ANY ADDRESS FOR ONLY 10 cents**

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Special Offer 1 Blank Cartridge Pistol, 100 Blank Cartridges, 1 550-page Novelty Catalog **ONLY** The **$1.50** Lot Shipped by Express Only **Cash with Order Only**

Johnson Smith & Co.

MAGICIAN'S BOX OF TRICKS

Apparatus and Directions for a Number of Mysterious Tricks, Enough for an Entire Evening's Entertainment..... $1.00

ANYONE CAN DO THEM

It is great fun mystifying your friends. Get this Conjurer's Cabinet, and you will be the cleverest fellow in your district. It contains the apparatus for ten first-class tricks, including The MAGIC BALL AND VASE TRICK (a wooden ball is placed inside, and upon replacing the lid has disappeared and is found in someone else's pocket); The HINDOO TRICK CARDS (can be made to change completely no less than five times); DISAPPEARING COIN BOX (a coin, placed in the wooden box, vanishes entirely or changes into a coin of another denomination); The GLASS GOBLET TRICK (a coin is dropped into a glass of water and when the water is poured out the coin has vanished and is found somewhere else); the RIBBON FACTORY FROM THE MOUTH TRICK (a seemingly endless supply of colored paper ribbons comes out of your mouth); the DISAPPEARING HANDKERCHIEF (a handkerchief held in the hand mysteriously vanishes); the WIZARD'S RING COIN TRICK; the ENCHANTED BOTTLE (no one but yourself is able to make it lay down); the GREAT HAT AND DICE TRICK (a large dice is placed on top of a hat, disappears, and is found underneath yet no one has touched the hat), and last, but not least, the GREAT PHANTOM CARD TRICK, or two from five leaves nothing. Full instructions are sent for performing each trick. In addition to the above, a number of other feats and illusions are fully explained for which you can easily make or procure the necessary apparatus. **Price complete $1.00 postpaid. JOHNSON SMITH & CO.**

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Very striking, quaint and uncommon. Silver finish; skull and crossbones design, two brilliant, flashing gems sparkle out of the eyes. Said to bring good luck. **Only 25c postpaid. Johnson Smith & Co.**

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25 Cents

It goes with real Yankee Pep—by its own power

Most remarkable toy ever invented. By drawing the Tank backward, either with the hand or over the floor or table and then placing it down, it will crawl along, overcoming all obstacles, in the same life-like manner as the larger Tank that proved so deadly in the great war. What makes it go is somewhat of a mystery, for there is no mechanism to wind up as is usually understood with mechanical toys, yet this tank will keep plodding along ten times longer than the ordinary run of toys. It will perform dozens of the most wonderful stunts; 2¾ inches long. **Price 25c.**

The "Little Giant" Typewriter

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A perfect little typewriter for $1.50. There are thousands of persons who would like to use a typewriter but whose needs and business do not warrant the expense attached to the purchase and use of a fifty or seventy-five dollar machine. To such persons we confidently recommend our Little Giant. It is strongly made, but simple in construction, so that anyone can quickly learn to operate it, and write as rapidly as they would with pen and ink. The letters of the alphabet most frequently used are so grouped as to enable one to write rapidly, the numerals 1 to 10, and the punctuation marks being together. With this machine you can send your best girl typewritten love letters, address envelopes, make out bills, and do almost any kind of work not requiring a large, expensive machine. **Price complete $1.50 by mail postpaid to any address in the world. Johnson Smith & Co.**

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125 CARD TRICKS and sleight of hand. Contains all the latest and best card tricks as performed by celebrated magicians, with exposure of card tricks used by professional gamblers. **Price 25c**

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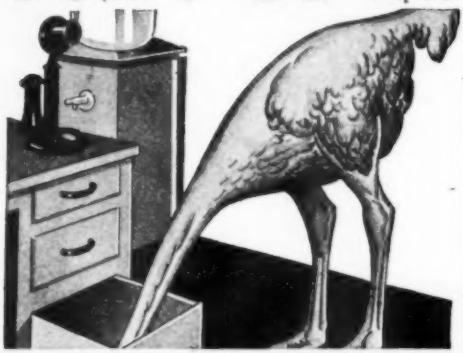
ROLL YOUR OWN SAVE MONEY

With this AUTOMATIC CIGARETTE MAKER you can make your own cigarettes from your favorite brand of tobacco and save money besides. It takes but a few seconds. Better cigarettes at about one-fourth the cost. Simplicity itself to use. It is neat, useful and handy. Pocket size, weighs but half an ounce. Case is made entirely of metal, nickel plated. Full printed instructions with each Cigarette Maker. Pays for itself in no time at all. **PRICE ONLY 25 CENTS POSTPAID. 3 for 65 cents; or 1 dozen for $2.25 postpaid**

Send remittance (Postage Stamps accepted) for all articles listed above, also in our other ad on previous page

JOHNSON SMITH & CO. Dept. 990 Racine, Wis.

DON'T BE AN



OFFICE OSTRICH

BECAUSE you won't face facts does not change the facts! And furthermore, you will have to face them sooner or later.

You can "kid" yourself, wear good luck charms and hope everything will come out all right — it doesn't matter which ostrich turn you take, fate is still a self-made fact!

In his heart of hearts, the office ostrich knows everything is not all right. He is worried about his job. He doesn't see any promotion ahead. He wonders what the boss thinks of him. He needs more money. But—

Mr. Office Ostrich needs more training! If he'll face the facts for a moment, he will admit this is true.

Thousands of men, in all professions and trades, have faced the facts—and solved their problems by spare-time study of International Correspondence Schools' Courses. They have acquired the training which made it possible for them to progress and earn more money. So can you! The coupon will bring you complete information.

INTERNATIONAL CORRESPONDENCE SCHOOLS

Box 2320-P, Scranton, Penna. *"The Universal University"*

Without cost or obligation, please send me a copy of your booklet, **"Who Wins and Why,"** and full particulars about the subject *before* which I have marked X:

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☐ Salesmanship ☐ Advertising	☐ Lumber Dealer

Name..... Age.....

Address.....

City..... State.....

Occupation.....

If you reside in Canada, send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada

ANDY'S SHOP MAIL BOX

(Continued from page 24)

home made light plane in the Hawaiian Islands looks like. I started building it on May 1st, 1929 and successfully test-hopped it on December 14, 1929.

I must say that I am well pleased with the new Heath B-4 motor. It works beautifully.

Yours for many happy landings,

GLENN T. BELCHER.

This parasol is said to be the first light plane in Hawaii.

THAT letter in the February issue by Ike Schultz sure brought a hearty response. All the fans who missed that diving helmet article now want the plans so that they, too, can walk around on the bottom. Incidentally, you fellows who have been writing in for back numbers containing the diving helmet plans will be glad to know that they are contained in the new 1932 edition of How-to-Build-It, now on sale at all news stands for 50 cents. If your local dealer is sold out, send me four bits and I'll see that the book goes right out to you. Here are a few of the best letters on the subject:

865 Main St.,
W. Lafayette, Ind.

Dear Andy:

A few months ago you published a picture of an ice zipper that Cadet Brown and I built at Culver. Brown is going to put a Cirrus on it, and will he get some real speed! But I won't have much to do with it this year as I am a boiler-maker at Purdue. I will get Brown to tell you about it when he has it finished.

The real reason for this letter is to tell you about an under-water flashlight I used last summer. I got the diving bug and made a helmet out of heavy galvanized iron in which we went down about 25 feet.

But to get back to the flashlight that Ike Schultz was asking about. I bought it at a ten cent store, and with a few alterations I made an excellent under-water flashlight.

It screwed in the middle, so all I had to do was to put a rubber gasket between the lens and the cap that holds it and tape over the switch which I left "on."

Then I removed the spring in the base and compressed it so that the weight of the battery would cause it to break contact at the bulb when the light was pointed straight up, but would make contact when pointed down or when held at a slight upward angle

(Continued on page 32)

Give me your measure and I'll *PROVE* You Can Have a Body like Mine!

I'LL give you PROOF in 7 DAYS that I can turn you, too, into a man of might and muscle. Let me prove that I can put layers of smooth, supple, powerful muscles all over your body.

If you are underweight I'll add the pounds where they are needed and, if you are fat in any spots, I'll show you how to pare down to fighting trim.

And with the big muscles and powerful, evenly-developed body that my method so quickly gives you, I'll also give you through-and-through health—health that digs down into your system and banishes such things as constipation, pimples, skin blotches and the hundred-and-one other conditions that rob you of the good times and the good things of life.

Here's All You Do!

Just jot down your name and address on the coupon below, mail it to me—and I'll send you, absolutely free, a copy of my new book, **"Everlasting Health and Strength."** It reveals the secrets that changed me from a 97-pound, flat-chested weakling into a husky fellow who won the title of **"The World's Most Perfectly Developed Man"** against all comers! And it shows how I can build you into an **"Atlas Champion"** the same easy way.

I haven't any use for apparatus that may strain your heart and other vital organs. I don't dose you or doctor you. **Dynamic-Tension** is all I need. It's the natural, tested method for developing real men inside and out. It distributes added pounds of powerful muscles over your body, gets rid of surplus fat, and gives you the vitality, strength and pep that win you the admiration of every woman and the respect of any man.

NOTE: No other Physical Instructor in the World has ever DARED make such an offer!

Charles Atlas

Holder of the title:
"The World's Most Perfectly Developed Man"—won in international contest against ALL strong men willing to compete with him.

CHARLES ATLAS As He Is Today. (Photo taken July 5, 1931.)

Gamble a 2c Stamp — To Prove I Can Make YOU a New Man!

Gamble a 2c stamp today by mailing the coupon for a free copy of my book, **"Everlasting Health and Strength."** It tells you all about my special **Dynamic-Tension** method, and what it has done to make big-muscled men out of run-down specimens. It shows you, from actual photos, how I have developed my pupils to the same perfectly balanced proportions of my own physique, by my own secret methods. What my system did for me, and these hundred of others it can do for you too. Don't keep on being only 25 or 50 percent of the man you can be! Find out what I can do for you.

Where shall I send your copy of *"Everlasting Health and Strength?"* Just your name and address down on the coupon, and mail it today. CHARLES ATLAS, Dept. 6-S, 133 East 23rd Street, New York City.

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New Pack Mag

SECOND ISSUE OF THE MECHANICAL

HERE'S the only magazine of its kind—it comes to you in box-like covers which contain both the magazine itself and an envelope full of parts for building a combination telegraph key and sounder.

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IN EACH copy of the Mechanical Package Magazine now on sale at all newsstands, you will find complete parts enclosed for building yourself a surprisingly efficient, loud clicking telegraph key which at the turn of a switch becomes a sounder with the regulation "tick-clack" sound you hear in railroad telegraph offices. In circuit with another Pack Mag key belonging to a friend the two instruments will comprise a serviceable, loud sounding line on which you can send actual code messages. Nothing to break; simple, serviceable, sturdy; runs on 4 volts. Get one with every Mechanical Package magazine.

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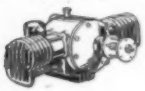
Here's a Partially Illustrated Table of Contents for Vol. 1, No. 2 of the MECHANICAL Package MAGAZINE

"Cross Country Twin"

For the first time in all publishing history a magazine is publishing plans for building a sturdy, reliable light airplane motor for cross country flying. Designed by Earl D. Hilburn, veteran designer, to specifications exceeding Dept. of Commerce requirements. Develops 40 h.p. at 2200 r.p.m. Don't miss this design story! Part one starts this issue!



Television Here is a complete answer to your questions: 1. What has been done in Television? 2. What is the present state of the Art? 3. What are the opportunities for the future? This story was compiled especially for the second issue of the Mechanical Package Magazine by Douglas L. West, Chief Engineer for the Baird Television Corporation, who knows more about the subject than any other man in the world. Actual data; no hooey.

"Katusha"—A Little Cruiser

Wouldn't you like to own the plans for a great little 18½-foot V-bottom cruiser with a bunk and galley in her for single-handed cruising? She's modern from keel to truck. Designed by Weston Farmer. She can go anywhere in any water safe

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for a boat of her length—long cruises on the Great Lakes, along the East or West coast. She'll do about 18 miles an hour with a stern drive Gray Light Four and gear drive. She's inexpensive to build, and you can assemble her a bit at a time to fit your purse, powering her with any of a number of motors. Equipment includes radio and gun rack, book shelves, stove, toilet, and electrical equipment you can build yourself. Any naval architect would charge from $100 to $300 for a set of plans like this. You'll find them in the second issue of the Mechanical Package Magazine!

Kites Secrets of flying kites are shown in a practical article on applied aerodynamics. Find out what makes a kite fly well and how to design and build your own!

Midget Autos First out with advance information on the design and building of small autos, the Pack Mag rides the advance wave of the new interest among hobbyists in baby autos.

Model Boats Plans and data on building a flash steam hydroplane 39 inches long that will do 40 actual miles per hour as pictured on the above cover painting.

Hobby lovers everywhere are acclaiming this vigorous new magazine. It is written up for alert minds—not written down for dubs. Plans for building man's size, interesting projects are contained in every issue. The Pack Mag will open a new world of technical interest for you.

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It tells you, page by page, how to get a steady

Government Position

I have shown thousands of fellows like you the way to secure the well-paid, **permanent** Civil Service jobs they now hold. And the very FIRST step they took was to send for my FREE BOOK. Get it quick! It tells you exactly what I would, if you came to see me in Rochester. Page by page this book tells you EVERYTHING you want to know about getting a Government Position. Here are a few "high spots":

PAGE 4 *tells What Uncle Sam Pays*
He's the finest, squarest boss in the world. You don't have to worry all the time about layoffs and being "fired"; HARD TIMES DO NOT AFFECT THE GOVERNMENT EMPLOYEE; and he gets an average of $200 a year more than other workers. Railway Postal Clerks start at $1,850 a year—can work up to higher paid jobs. My book gives salaries of every branch.

PAGE 9 *tells How You Pick Your Job*
Pick the job you want; I'll help you get it. You can work in your home town, travel, or work in Washington, D. C. Uncle Sam has many openings.

PAGE 12 *tells How I Prepare You Quickly*
For eight years I was Official Examiner of the Civil Service Commission, so I know just what kind of questions are asked. You can depend upon me to help you to pass HIGH, and be offered one of the FIRST jobs open.

PAGE 18 *tells About Raises Every Year*
You don't have to take the boss's vague promise of a raise—and never get it. You can **depend** on your increase from Uncle Sam. Read all about this BIG ADVANTAGE in my FREE BOOK.

PAGE 18 *tells About Vacations with Pay*
In some branches you get up to 30 days with pay every year, and up to 30 days' sick leave. See my book for full information on this liberal plan.

PAGE 10 *tells About Civil Service Pensions*
Uncle Sam doesn't chuck you out when you're "too old." He retires you on a generous pension. Get my book and read all about this.

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If you're an American citizen, 18 to 50, you can quit worrying FOREVER about losing your job or being laid off. I mean it! There's a wonderful PERMANENT position waiting for you in the Civil Service. You can be a Railway Postal Clerk, Postmaster, Customs Service Man, Post Office Clerk, City Mail Carrier, or get any of the other positions described in my book. Send for it NOW and find out how I help you GET THE JOB YOU WANT! Get ready NOW for the next Railway Postal Clerk Examination. Mail the coupon today!

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Name.....

Address.....

City.....State.....

ANDY'S SHOP MAIL BOX

(Continued from page 28)

after having been lighted first by pointing down.

Next summer I am going to rig up a real outfit. I have designed a power compresser using a two-cylinder motorcycle engine. Also two underwater cameras—one movie and one still. I am also going to have a two-way telephone in the helmet with current supplied by the compressor.

S'long,
N. NELSON LEONARD JR.

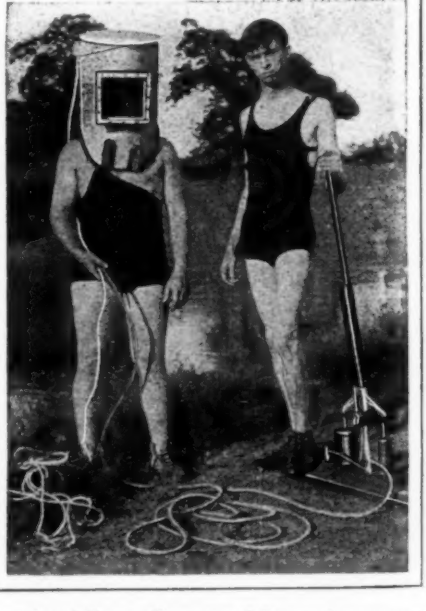
Sounds as if you know your stuff, Nelson. How about it, gang, would you like to see a picture of his outfit (the old one)? Okay, me hearties, take a look below. And now here's another letter along the same lines:

Downsville, N. Y.

Dear Andy:

I am very much interested in diving and have built two diving helmets of my own. They both proved to be very successful.

I noticed the letter written by Ervin Schultz, saying that he wanted a light for night diving. I have a light of this kind made by merely putting a lighted flashlight

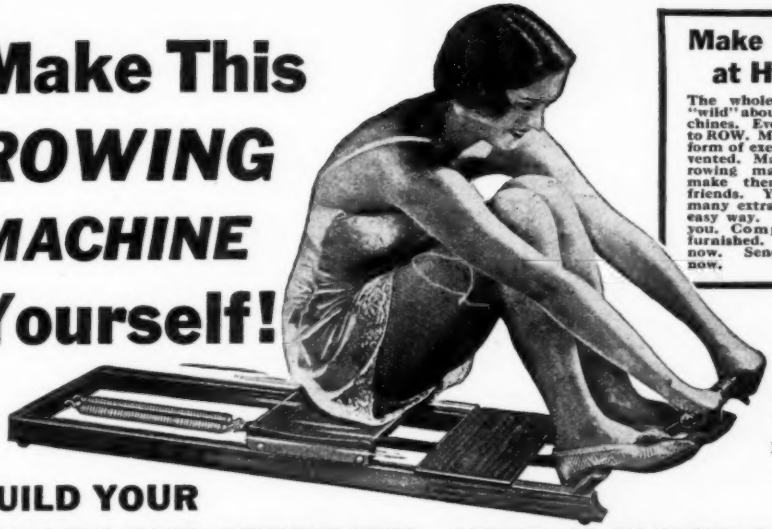


Leonard and Brown demonstrate helmet and compressor.

into a quart glass jar and then clamping the cover on. This can be made into a handy lantern by putting a wire handle on it. The jar is weighted with a small lead bar to sink it.

(Continued on page 34)

Make This ROWING MACHINE Yourself!



Make Money at Home!

The whole country is "wild" about rowing machines. Everybody loves to ROW. Most enjoyable form of exercise ever invented. Make your own rowing machine, then make them for your friends. You can earn many extra dollars this easy way. We will help you. Complete plans furnished. Mail coupon now. Send no money now.

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BUILD YOUR HEALTH AND STRENGTH...KEEP SLENDER AND FIT

Now—with a few tools—a few feet of lumber, and the parts and blue prints we furnish, you can build your own Rowing Machine. Hundreds of thousands of Rowing Machines have been purchased at $12 to $55 each. Imagine making one for only $3.98, complete with rolling seat.

No Other Form of Exercise is so pleasant for the entire family. Like having a **Health Club Gymnasium** in your own home. Keep fit and strong. Remove excess fat. Gain strength! You will enjoy rowing because it is more fascinating than a game! All your neighbors and friends will want you to make rowing machines for them too. Make money in your spare time.

Complete Set of Parts ...also Blue Prints for Making Frame

only $3.98 PLUS POSTAGE

What You Get

1. 4 Specially made rubber wheels, with hard center and soft rim. The same type of rubber wheels used on rowing machines which sell for $25 to $55.
2. Set of axles for wheels.
3. Heavy cotton webbing, with fasteners.
4. Set of flexible actuators of our own design. Safe and strong.
5. Lignum Vitae pulley including axle and housing, over which the webbing rolls.
6. All necessary screws, bolts and nuts.
7. Six rubber "feet" on which the machine rests when completed.
8. Complete set of blue prints.
9. License for making, under our Patent Applications.
10. Expert plans for selling to neighbors and friends.

This Rowing Machine is exactly the same as the **Flex-Roll** which we are advertising in all the leading magazines. We furnish all the parts that you need. The frame is easy to make by following our simple blue prints. Any wood can be used. Read list of parts furnished. If you can use a saw, plane, and screw driver you can make this rowing machine in a few hours, at home.

Send No Money

Just mail coupon. We will send kit of parts and complete blue prints at once. Pay postman only $3.98 plus postage. Money back if not delighted within a week. You take no risk. Everybody needs exercise daily. Especially the women folks who want to keep slender, and everybody who wants to be strong and healthy! Rowing, on the **Flex-Roll**, with its thrilling rolling seat is a joy ride to wonderful Health, Youth and Slenderness. Make this rowing machine at home for yourself and family, and make them for others, for profit. The whole country is wild about rowing machines! Now is the time to make yours, this easy, inexpensive way. Mail coupon now.

Steelflex Corp. of America, Dept. 294, 1785 East 11th St., Cleveland, O.

STEELFLEX CORPORATION OF AMERICA
Dept. 294, 1785 East 11th St., Cleveland, O.

Please send me complete set of parts for building the **Flex-Roll** Rowing Machine, including blue prints for making frame. I will pay postman $3.98 plus postage. You agree to refund my money within one week if I am not delighted.

Name .....

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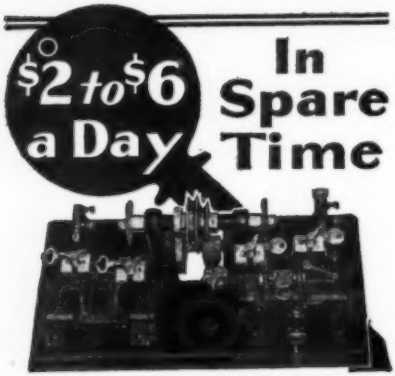
(Canadian and Foreign Prices on Request)



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This perfected NEW Machine is a marvel of simplicity, accuracy and speed in cutting all kinds of keys . . . cylinder keys, flat keys, bit (house) keys, automobile keys. So easy to operate that a boy can do the work perfectly. Experienced locksmiths declare it superior to anything they have ever seen. Its patented features assure a smooth, finished, perfect-fitting key in one operation, in 12 to 20 seconds.

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Please send complete information about the Foley Automatic Key Machine.

Name .....

Address .....

City ..... State .....

ANDY'S SHOP MAIL BOX

(Continued from page 32)

I used the light last summer in an attempt to repair a broken outlet valve in a small lake near my home. There was a stone pier built out from the dam, and a well sunk in this to a depth of 25 feet. It was dark as pitch at the bottom of this hole so I made the lamp.

On the next attempt I took this light along. It proved to be a great help, lighting the water up like gold. However, I couldn't fix the valve because the wall had settled forward, making it impossible to get at it.

Yours respectfully,
JACK ROWE.

Well, Ike, there are two ideas—both of them good. I have some more letters on this subject that will have to wait until next month.

HANGAR NOTES

BLUEPRINTS for the Ramsey "Flying Bathtub" have recently heard of the depression, and have reduced themselves to $4.00. What's the matter, Gang, is this too much airplane for you? I haven't heard of anyone building a tub yet.

OSCAR SAGLI, Route 1, Rathdrum, Idaho, is starting a glider club and wants to hear from those living in his part of the country who might be interested.

ANDY JONES, Box 245, Ephrata, Washington, wants the gang to write to him. He's building a P-H racer and will tackle the Baby Bullet next. He evidently wants speed.

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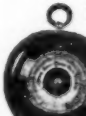

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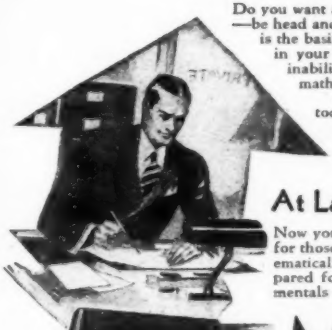

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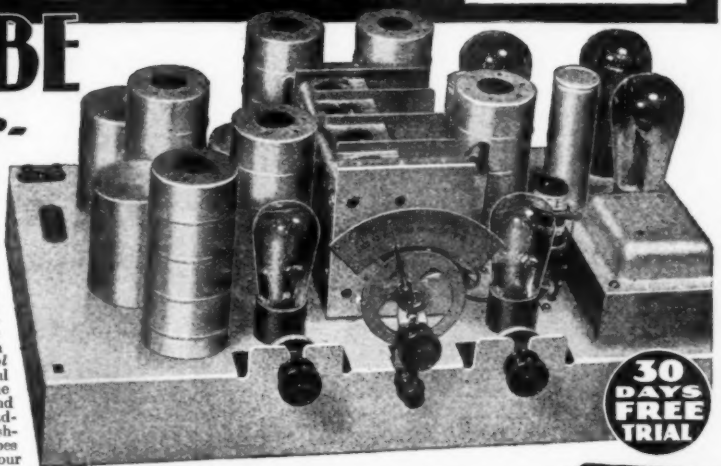

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Hawke's Bay, New Zealand.

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Dept. 64
Cincinnati, Ohio.

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USER AGENTS
We pay you BIG MONEY just for showing your radio to friends and neighbors. Easy EXTRA MONEY! Check coupon for details.

Name.....

Address.....

Town.....State.....

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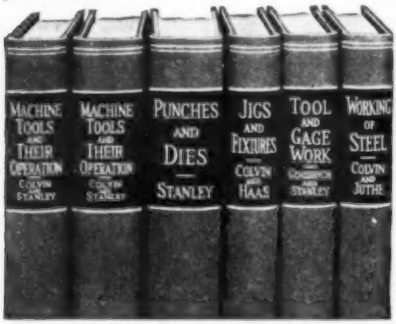
And the author of that sentence might have added "AND SAVE YOUR JOB AT THE SAME TIME" if he had thought of a machine shop when he wrote it.

A ruined piece of work these days usually means a lost job. Only good men *have* jobs now, and to *keep* them they must make themselves top-notchers.

You can do a lot toward insuring your own job with the—



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Company ..... M.M. 4-32

The Lowdown on Constance BENNETT

Is she high-hat? An intimate of Connie's reveals that she's a lot different than you've been led to believe. Also in this issue: Jimmy Durante, Greta Garbo, Bing Crosby, Tallulah Bankhead, Ben Lyon, Sylvia Sidney, Ricardo Cortez and Minna Gombell. Get your copy today!

APRIL

A FAWCETT PUBLICATION

SCREEN PLAY

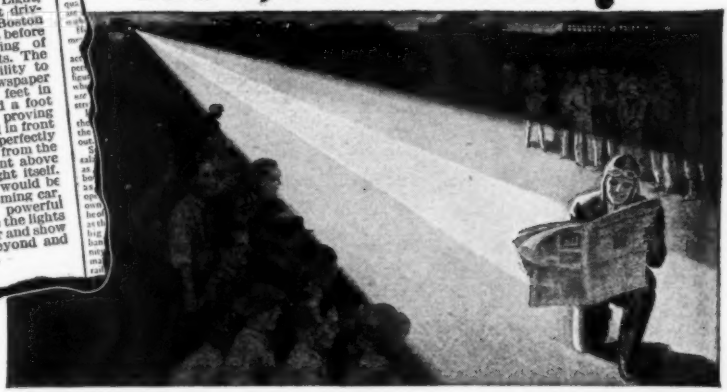
NOW ON SALE

If your news dealer is sold out, send 25c in stamps or coin to SCREEN PLAY Magazine, 529 South Seventh St., Minneapolis, Minn., and a copy of April SCREEN PLAY will be sent to you immediately.

Mystery "TWIN-RAY" Light Tested—Reads Newspaper At 1,000 Feet!

SEVERE TEST GIVEN NEW SAFETY LIGHT

June 8th: A demonstration of the new Auto Safety Light, designed for safe night driving, was given at the Boston airport on Friday night before an interested gathering of pilots and automobilists. The first test was the ability to read any part of a newspaper at a point of 1,000 feet in front of the light and a foot above the ground, proving that while the ground in front of the light was perfectly illuminated, the rays from the light were at no point above the center of the light itself. Consequently there would be no glare to an on-coming car, showing the light powerful enough to penetrate the lights of the on-coming car and show clearly the road beyond and any obstacles in it.



Lights Highway Ahead With 67,000 Candle Power Beam

Reporters for the Boston Sunday Post witnessed a demonstration of this light and above is a reprint of their report.

Now—judge for yourself what you can do with a light like this on your automobile—a light that throws a 67,000 candle power beam, for over 1,000 feet—lights up all road signs and curves long before you reach them. Makes the road ahead of you as bright as day yet absolutely can't glare in the eyes of approaching drivers. A road light that literally takes the light out of the sky—all light on the highway. Fast night driving now safe with this amazing Speedlight—you can drive 50-60—even 70 miles an hour with perfect safety. On a road as brilliantly lighted at midnight as at mid-day. Cuts through fog, rain, and darkness. This "twin-ray" road light not only can't glare itself but it cuts through on-coming brights. No wonder it was awarded the grand prize and two gold medals in world competition.

AGENTS Cleaning Huge Profits

Agents and distributors from coast to coast are making big money equipping passenger cars, busses and trucks with this brand new road light. This is your opportunity to make up to $10-$20-$30 per day. Some agents make even more. Kinney made $96 in a few hours. Frost made $150 in one day. Burroughs sold fifty lights to Richmond fire and police departments. Over 20 million cars need this wonderful light to protect human lives and property against glaring lights, fog, rain and darkness. Hundreds of men have made big fortunes out of makeshift spot lights and painted bulbs that only did half the job. Send the coupon and find out how you can use this great device to build up a crew of your own—and double your earnings—earnings which by themselves will be bigger than you ever saw before. Do it now, before you turn this page.

Cuts Through London Fog and Darkness Like a Knife

Tests in England have proved this. With this light you need have no more fear of fog, rain or darkness. There is no light like it in the world. It is not a spot. It embodies an absolutely new principle in headlighting discovered by a famous light engineer. NOT A PAINTED BULB—But a real scientifically constructed road light with a concentrated 67,000 candle power beam of light on the road for over a thousand feet and no glare. Think of it! Over a fifth of a mile. Put one on your car and see for yourself what you can do with a light like this. Send the coupon today for our introductory offer.

SPEEDLIGHT COMPANY

1731 Belmont Ave., Dept. 50-D, Chicago, Illinois

TO GET THIS LIGHT

FREE of Extra Cost

DON'T TURN PAGE—
MAIL THIS COUPON FIRST

SPEEDLIGHT COMPANY,
1731 Belmont Avenue,
Dept. 50-D, Chicago, Illinois.

Without obligation to me please send me full details of your Speedlight and your wonderful introductory offer.

NAME.....

ADDRESS.....

CITY.....STATE.....

Where TELEVISION

by **DAVID SARNOFF**

President, Radio Corporation of America

What progress is being made in television? How far has it advanced today? What new developments lie in the immediate future? These pressing questions, about which the vast public waiting for television is wondering, are answered in this unusual article by Mr. Sarnoff, whose eminence in the field enables him to speak with unquestioned authority.

IMPORTANT strides are being made with television. In our development work now proceeding at Camden, N. J., we are seeking to perfect television to a point where it is capable of rendering real service before offering it to the public.

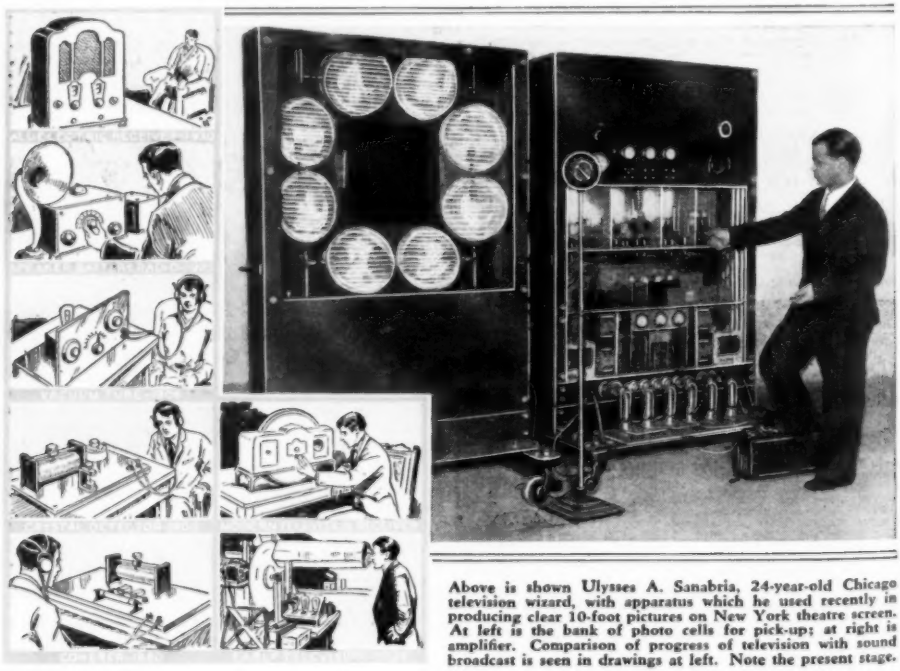
While the public was willing, and even eager, to experiment with radio in the early stages of broadcast development, it seems to us that it will desire a comparatively more advanced television receiver than the early crystal radios.

There was no precedent for the taking of sound and music out of space, but the public has been educated by the motion picture industry to expect picture transmission of a high quality, and it is doubtful whether interest can be sustained by inferior television images.

The progress we have made so far has given us the belief that ultimately a great service of television can and will be made available. I do not believe that television will supersede sound broadcasting by radio. It will be a correlated industry.

The present status of television might be likened to the condition of radio in the immediate pre-broadcasting era, when amateurs were beginning to hear faint sounds through the air.

Voices and music were passing through space in those early days of radio; comparably, there are actually some images passing through the air today. They are



Above is shown Ulysses A. Sanabria, 24-year-old Chicago television wizard, with apparatus which he used recently in producing clear 10-foot pictures on New York theatre screen. At left is the bank of photo cells for pick-up; at right is amplifier. Comparison of progress of television with sound broadcast is seen in drawings at left. Note the present stage.

Stands Today

An authority surveys the present and looks into the future

What is the future of television? Authorities expect that the type of home receiver which will win the most widespread favor will be one of the three systems illustrated above, or perhaps some other system not yet invented. The scanning disc wins favor because of its simple practicability; the cathode ray tube has advantage of operation without moving parts; the Baird System surpasses by permitting movie-size pictures with unusual brilliance and definition.

being received by established experimental stations and by amateur operators in various sections of the United States.

The next stage should find television comparable to the ear-phone stage of radio. Then, television should attain the same degree of development as did radio sound broadcasting in the early period of the crystal set.

This does not mean that the actual physical structure of the first television receiver will be similar in any way to the crystal receiver.

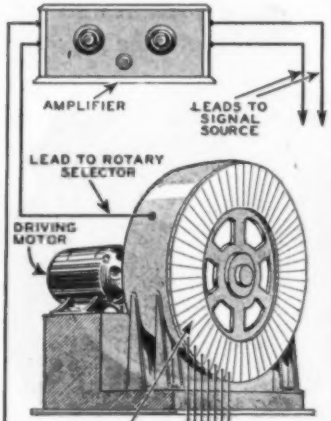
Before television reaches the practical stage of service it is necessary that several experimental stations for the transmission of sight by radio be established. Through the operation of these experimental stations, we expect to obtain exact information and practical field experience which are required before definite plans can be developed for a television service of nationwide scope.

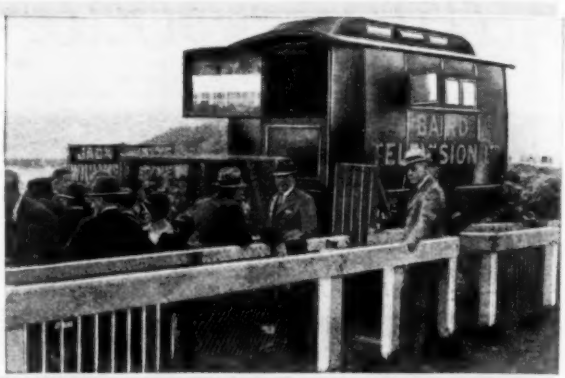
The effect of television upon the present established radio industry will be beneficial. There will be no interference between the broadcasting of sound and of sight. These services will supplement each other and complete the impression upon the human mind by reaching it through both the eye and the ear.

Television broadcasting stations will operate on wave lengths different from those now used for the broadcasting of sound. An entirely different receiver will be necessary. In the practical sense of the term, television must develop to the stage where broadcasting stations will be able to broadcast regularly visual objects in the studio, or scenes occurring in other places through remote control.

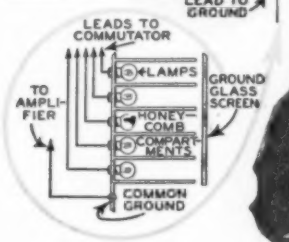
Reception devices must be developed

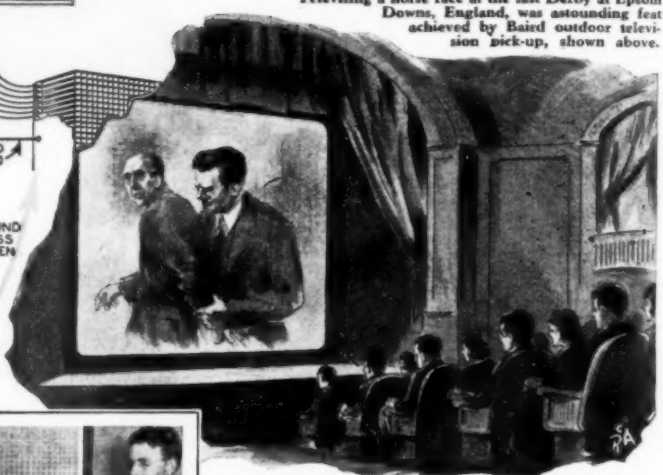
Baird System May Bring Theatre Television With Clear, Bright Images





Televising a horse race at the last Derby at Epsom Downs, England, was astounding feat achieved by Baird outdoor television pick-up, shown above.





Chief advantage of the Baird system is that it makes possible television in the theatre, with images having unusual brilliancy with fair definition. The image is built up with small lamps in the compartments, current to the lamps being delivered from segments contacted by rotary selector connected to receiving amplifier, as illustrated in drawings.

Here Mr. Baird is demonstrating how image appears on the ground glass screen, built up in "square-effect" by lamps set in honeycomb-like compartments in the rear.

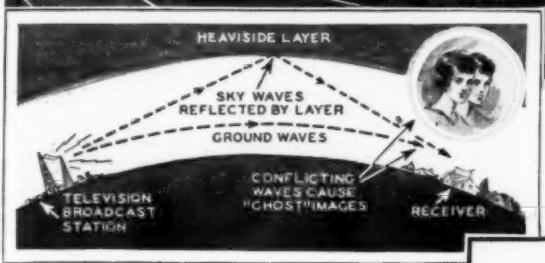
that will make these objects and scenes discernible in millions of homes.

Devices must be built upon a principle that will eliminate rotary scanning discs, delicate hand controls and movable parts. Research must make possible the utilization of wave lengths for sight transmission that will not interfere with the use of the already over-crowded channels in space.

The potential audience of television in its ultimate development may reasonably be expected to be limited only by the population of the earth itself.

This vast increase in the entertainment audience has been made possible by the introduction of modern science into the older arts. And now television will come to open new channels, to provide new opportunities for art and the artist and to create new services for the audiences of all the world. Potentially speaking, tele-

Television Programs Sent on 4 Meter Waves to Prevent "Ghost" Images



To eliminate "ghost" images and permit greater number of picture elements, resulting in clearer images, engineers are building television transmitter atop Empire State Building, in New York, which operates on 4 meter wavelength. Waves are radiated directly to receivers, with no intervening obstacles, and serving audience of more than ten millions.

Television images broadcast on usual wavelengths (150 meters) sometimes result in "ghost" images at distant receivers. Sky waves reflected by heaviside layer lag behind ground waves and consequently arrive out of phase at receiver, causing double picture as illustrated in insert above.

vision can be utilized by 26,000,000 homes in this country alone.

The instantaneous projection through space of light images produced directly from objects in the studio or the scene brought to the studio by remote control involves many problems.

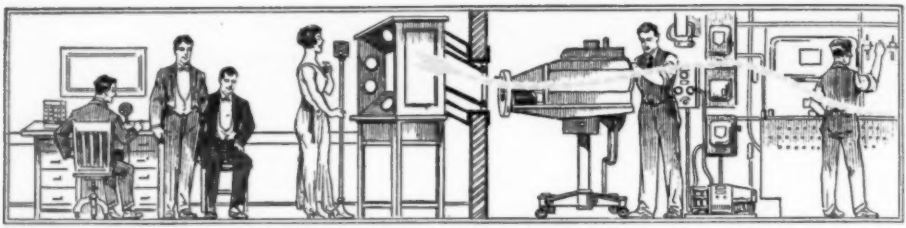
Special types of distribution networks, new forms of stagecraft, and a development of studio equipment and technique will be required. With these must come a new and greater service of broadcasting, both of sight and sound. A new world of cultural and educational opportunities will be opened to the home.

But even more appealing to the individual is the hope that television may, at least in a measure, enable man to keep pace with his thoughts. The human being has been created with a mind that can encompass the whole world within the fraction of a second. Yet his physical senses lag woefully behind. With his feet he can walk only a limited distance. With his hands he can touch only what is within reach. His eyes can see at a limited range and his ears are useful at a short distance only.

When television has fulfilled its ultimate destiny, a man's sense of physical limitation will be swept away, and his boundaries of sight and hearing will be the limits of the earth itself.

OUT-OF-FRAME VERTICALLY
OUT-OF-FRAME HORIZONTALLY
POOR DETAIL DUE TO TOO FEW PICTURE ELEMENTS
REVERSED OR "NEGATIVE" IMAGE
LIGHT STREAKS OVER IMAGE
IMAGE SHIFTING FROM SIDE TO SIDE

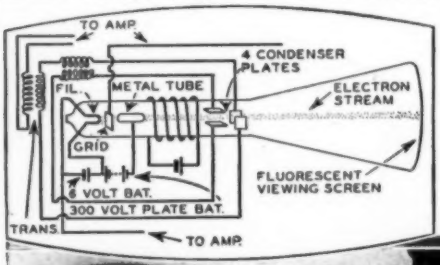
Drawings above illustrate most outstanding difficulties still encountered in present day television reception. When receiving scanning disc motor is out of synchronism with transmitting motor, images shift from side to side, or get out of frame vertically or horizontally. Pictures with poor detail usually result from insufficient number of lines in the transmitter scanning disc. Static causes light streaks.



Television programs travel the route from photo-electric cells to home television receiver as indicated by the dotted arrow. Voice is picked up by the "mike" while the performer, illuminated by the flying spot from the projector, is televised with the bank of photo cells. Operator of the projector has task of adjusting the "flying spot."

EDITOR'S NOTE: In connection with the predictions made above by Mr. Sarnoff, engineers expect the development of television will follow along the lines of one of three outstanding systems now being employed. A tense but silent battle is now being waged between these systems—the Baird system, developed by John Logie Baird, of England; the well-known scanning disc system; and the cathode ray tube system, which has a great advantage in that it employs no moving parts.

The Baird system promises to open a new field of television movies, both in the theatre and in the home. With the perfection of this system, which is illustrated in an accompanying drawing, we may be able to sit comfortably in our home or in the theatre and watch the performance of plays being transmitted from a master theatre, much in the manner of present chain broadcasting.

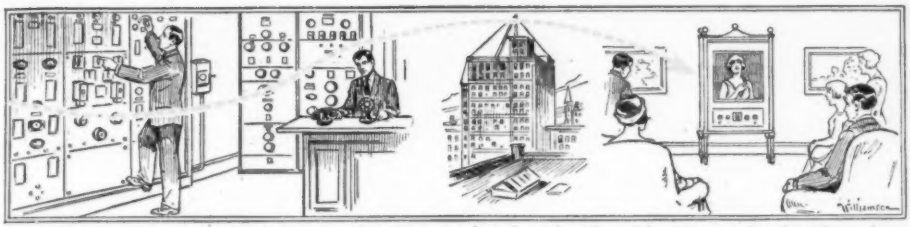


This future development of television was foreshadowed in a demonstration conducted recently in London. For a period of some thirty minutes the audience was treated to visual and aural entertainment by several well-known British artists performing in a distant studio. The images were declared by spectators to have a brightness and definition comparable to the usual motion picture performance.

The images were produced on the screen, measuring 2 by 5 feet, by a bank of 2,100 small tungsten filament lamps, each of which was set in a small compartment. The 2,100 compartments formed a huge honeycomb, thus building up the image in small squares. To diffuse the image and thus eliminate to a great extent the "square effect," an opaque screen of ground glass was placed before the "honeycomb."

The battery of lamps is switched on

Elimination of the cumbersome scanning disc and other moving parts is made possible by use of the cathode ray tube, shown at left. Image is built up on the fluorescent screen by "pencil" of electrons, which are caused to swing rapidly over screen by electrostatic action of the condenser plates. At right is shown cathode ray receiver used to pick up programs from W6XAO, Los Angeles, California, now broadcasting regularly on 6¾ meters, or 44,500 kilocycles.



Continuing the path of the television program. The outgoing signal is adjusted in the control and made ready to put on the air over antenna at wave lengths usually around 150 meters. Signal is then picked up at home antenna and led into home television receiver for entertainment of the family. Voice and picture are reproduced in synchronism.

and off to form the image by a special commutator machine having 2,100 segments, each of which is connected to a lamp in the "honeycomb." A rotary contact arm, or selector revolving at a speed of 750 R.P.M., sweeps over the aforementioned segments, delivering current to the lamps at a rate of over 25,000 contacts every second!

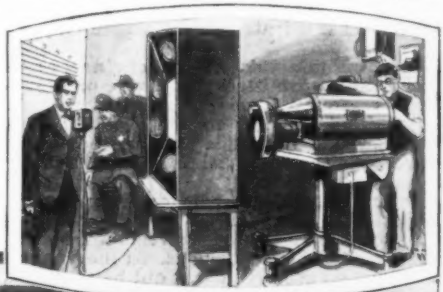
The majority of engineers at present are striving to develop a home television receiver which eliminates the cumbersome scanning disc. What is sought is a receiver which is quiet in operation, practically fool-proof, and which has a minimum of moving parts to get out of kilter.

The cathode ray tube possesses many of the qualities necessary to fill the bill. Forming an almost self-contained unit, save for the amplifier, the cathode ray tube is primarily a projector, with a glass screen covered with a fluorescent material. The filament of the tube emits a stream of moving electric particles which are transformed into a pencil point of light when they impinge on the fluorescent screen.

Controlling this electron stream are two sets of deflecting plates swinging the stream of particles back and forth to correspond with the motion of the scanning instrument at the transmitter. The result is a complete scanning of the fluorescent screen on the end of the tube, building up the image as it sweeps back and forth.

The system which has found most widespread use at present, particularly in the United States, makes use of the well-known scanning disc. Credit for the most outstanding development with this system to date goes to Ulysses Sanabria, young Chicago inventor, who has perfected equipment which can project an image of remarkable brilliance and definition on a 10-foot screen.

At a demonstration conducted recently in a New York theatre, 2,000 people witnessed



Television transmission is now brought down within the reach of the radio amateur, thanks to the new transmitter shown at left which was recently put on market for $250. Drawing at upper right illustrates how television may aid police by broadcasting photos of criminals. Below is police authority demonstrating how criminals can be televised.

a television program which drew such comments as from "pretty good" to "extremely creditable."

What distinguishes the Sanabria system is the new high power lamp which projects the flying spot on the screen, and the specially designed transmitting and receiving scanning discs. The receiving disc has 45 holes in all, arranged in three sets of spirals, each covering 120 degrees of the disc. With such an arrangement one-third of the entire surface of the subject is scanned in one-third of a revolution of the disc, which rotates at 900 R.P.M.

It is the unusual design of the projector which makes possible the almost movie-size images. The disc, 3½ ft. in diameter, instead of having mere holes is fitted with 45 lenses, each two inches in diameter.

Directly behind this disc is a Taylor projector lamp, designed by Mr. Sanabria, who is keeping its construction a secret. The screen on which the image is formed is set 18 feet in front of the projector. The translucent material of the screen permits the image to be thrown against it from the rear, while the audience views the performance from the front.

Most of the current television programs are being broadcast on wavelengths around 150 meters. Signals transmitted over a distance of more than 150 miles, however, tend to show "ghost" images on the viewing screen, as illustrated in an accompanying drawing.

To eliminate this defect, engineers are designing transmitters to operate on wavelengths around 5 meters. The waves are transmitted directly to the receiving antennae, so that reflection of secondary waves from the heaviside layer to the receiver is avoided.

Regular television service from station W6XAO, in Los Angeles, was opened recently, broadcasting on a wavelength of 6¾ meters, or 44,500 kilocycles. At the present time signals are being sent out between six and seven P. M. (P. S. T.). Eighty lines are used and the image is repeated fifteen times per second.

There are practically no mechanical features to the system in use at W6XAO, as the system employs cathode ray beam at both transmitter and receiver, instead of motors and scanning discs. The receiving area extends approximately forty miles from the point of projection. Reception is also weakened by intervening hills.

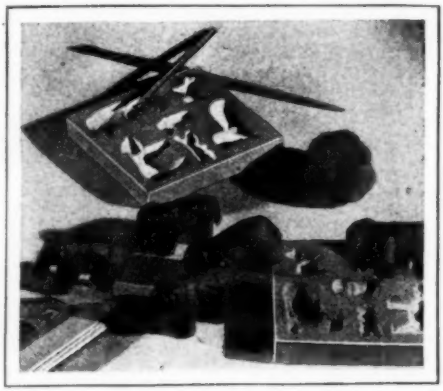
The early part of the year of 1932 will see the inauguration in New York City of a new low-wave television broadcasting system operating down on 4 meters. The antenna is now in process of construction on the tip of the mooring mast of the world's tallest structure, the Empire State Building.

The station is expected to serve only an area within 15 to 25 miles of the tower, as the waves are limited to visible distances. In this area, however, an audience of ten million can be served.

Despite the present status to which tele-

(Continued on page 170)

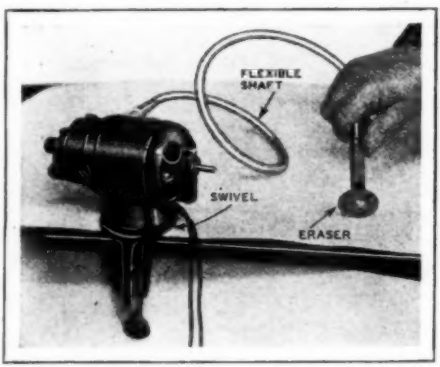
Materials for Sculptors



Youngsters can shape all kinds of animals with the molds shown in photo above. Clay is pressed into these molds, then the two halves of the figure are joined together.

YOUNGSTERS with artistic inclinations will welcome a scheme of amusement, now being marketed, which permits the moulding of all kinds of animals. Shown in the photo above, the molds consist of complementary blocks into which the clay is pressed. The halves of the animal are formed and then pressed together to make the completed figure. The process is so simple that any child can carry it out.

Motor-Driven Draftsman's Eraser



Disc eraser is revolved by the flexible shaft on the motor.

A MOTOR-driven eraser now being marketed for architects, designers, draftsmen, etc., permits errors on drawings and manuscripts to be erased quickly and easily. As shown in the accompanying photo, a flexible drive shaft connects the motor with the disc-shaped eraser.

The motor may be secured in any convenient spot on the desk or table by means of a clamp, while the motor is mounted on a swivel to afford utmost flexibility.

Slot-Rotor Latest Form of Wingless Plane

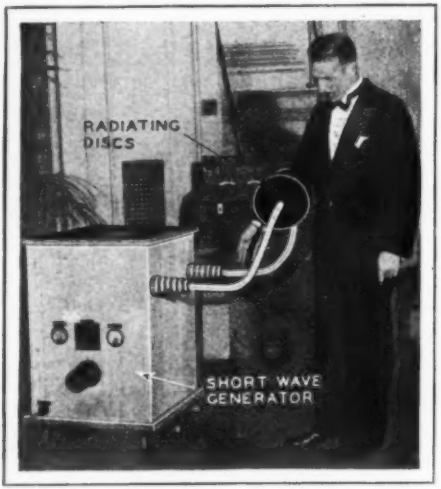
LEFT- A CLOSE-UP VIEW OF THE SMALL AUXILIARY MOTORS
FRAME
SMALL POCKETS OR SLOTS WILL INCREASE ROTOR EFFICIENCY
ROTOR BEARING
ROTOR CONTROL LEVER
CLUTCH
SPROCKET
DURAL ROTOR THIS WAY
GAS TANK
PLATFORM
ON EACH SIDE OF SHIP A TWIN CYLINDER AIR-COOLED MOTOR DRIVES ONE SET OF SPINDLES OR ROTORS THRU CHAIN AND SPROCKET GEAR.
ROTOR CONTROL CLUTCH
FOUR CYLINDER CIRRUS AIR-COOLED MOTOR DRIVING NORMAL TYPE AIRSCREW PROVIDES FORWARD MOTION IN THE USUAL MANNER
BRIDGE-LIKE GIRDER SUPPORTS SPINDLES
MAIN ROTOR
CHAIN
FRAME
SECONDARY ROTOR
PLATFORM FOR MOTORS
CONVENTIONAL TAIL SURFACES
DOUGLAS ROLFE

I. C. Popper, left, construction engineer, points out unique slots in rotor while J. B. H. Guest, the inventor, looks on.

GREAT lifting power and low landing speed are features expected to be achieved in an ingenious form of rotor plane now being built in New York City. Four rotor spindles, two on each side of the fuselage, take the place of the usual airplane wing, as illustrated above.

These spindles, whose form is somewhat like that of an inverted hour glass, contain numerous slots in their surfaces which are expected to increase lifting efficiency. The rotors are turned by two air-cooled engines, one on either side of the fuselage, and traction is supplied by a third motor mounted in the conventional way in the nose. J. B. H. Guest is the inventor of the new plane, which will be ready for tests within a short time.

Fever Machine Treats Rheumatism by Short Wave Radio



In this new portable fever machine, rheumatism is treated by placing body members between radiating discs, which serve as antenna for short wave generator contained in the cabinet.

THE treatment of rheumatism by short wave radio is among the benefits which radio engineers have bestowed upon modern medicine.

An instrument which makes this possible was demonstrated before scientists recently in New York. Known as the "Radiotherm," the device works on the same principle as a short wave transmitter. The generator is contained in the cabinet, while the radiating discs act as an antenna.

The "Radiotherm" can produce artificial temperatures as high as 98 to 105 degrees. More than 500 treatments have been given.

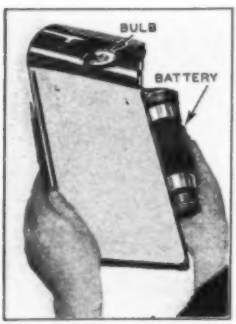
Dangers of Using Old Medicine

ONE of the commonest home errors in matters of family health is to give a member of the family medicine originally prescribed for someone else.

One of the children may have been sick. The doctor was called and prescribed a certain remedy which proved successful. Later on, when another member of the family with similar symptoms falls ill, the usual habit is to have the old prescription refilled and try to cure the new illness with the remedy which cured the old.

This self-diagnosis and self-medication may sometimes be productive of serious mistakes. It is a good rule to throw away each person's medicine after the illness.

Illuminated Menu for Dim Rooms



Menu illuminated by light bulb.

HERE is something new for the diner in restaurants where the lights are dim. It is an illuminated menu, having a flashlight battery attached at the right to operate a bulb set in a reflector at the top, as illustrated. The switch to turn on the bulb is placed in the battery case, which forms a handle for the menu frame.

Bill-Saving Lock for Dial Phones

LONG distance and other expensive calls made over your telephone without your consent can be prevented by a dial lock now being marketed. The lock consists of a metal cover which fits snugly over the dial, and is equipped with a lock which holds it firmly in place, as illustrated in the accompanying photo. Key may be carried on ring.

Cover is locked over phone to prevent unauthorized calls.

Automat Now Eliminates Bartender

BAR tenders are eliminated by a new automat bar recently introduced in London. By means of a slot and dial, the customer is enabled to procure himself any drink on the list. Dialing the drink number delivers a "shot" from a spigot. At left are soft drinks, while on right are wines.

Dialing number of soft drink or wine delivers a shot from the spigot, thus eliminating customary bar tenders.

ODDITIES of Science

by NIC SPRANK

NIC SPRANK WILL PAY ONE DOLLAR FOR EACH IDEA USED ON THIS PAGE

SOUND WAVES CAN STERILIZE MILK AND REDUCE GLASS TO POWDER
THE NORTH POLE OF A COMPASS POINTS SOUTH
Robert L. Anderson, Carroll, Iowa.
NORTH POLE
A BRICK LIGHT ENOUGH TO FLOAT ON WATER WILL SUPPORT A SKYSCRAPER
YOU COULD WASH YOUR HANDS COMFORTABLY IN BOILING WATER ON TOP OF MT. EVEREST
A STRING WRAPPED THREE TIMES AROUND YOUR HEAD WILL EQUAL YOUR HEIGHT
NOTHING IS DESTROYED WHEN A HOUSE BURNS
(CONSERVATION OF MATTER)
Nic Sprank

Sound waves, stepped up to intensities of 300,000 cycles per second (20,000 cycles is highest audible frequency) are so powerful that they destroy germs and low forms of life, and their vibrations shatter glass to powder. Attraction of opposites accounts for south magnetic pole of compass needle pointing to earth's north pole. A building brick light enough to float, yet very strong, has been perfected. Low atmospheric pressure at high altitudes permits water to boil with slight heat.

SUBMARINE SAFETY—

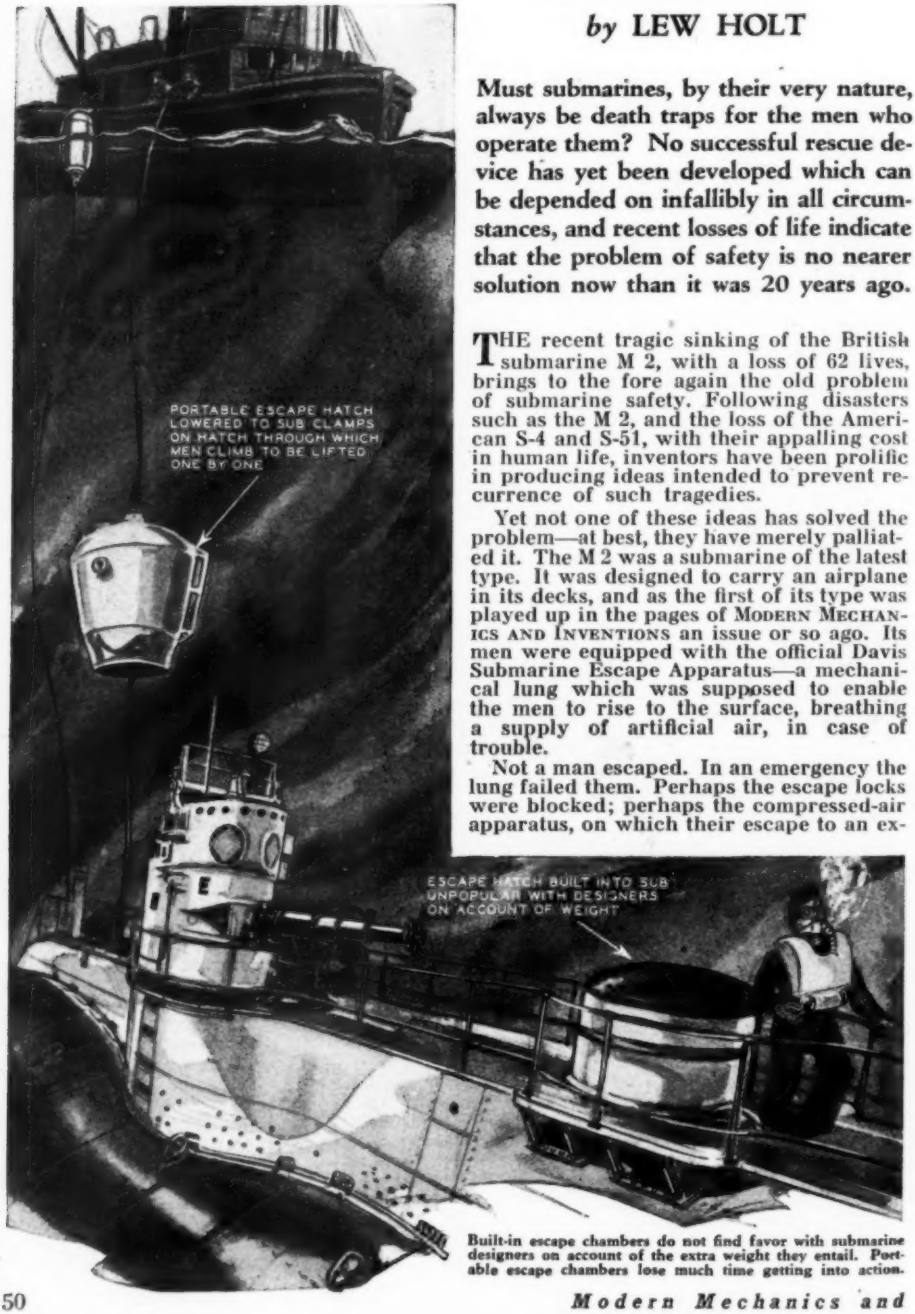
by **LEW HOLT**

Must submarines, by their very nature, always be death traps for the men who operate them? No successful rescue device has yet been developed which can be depended on infallibly in all circumstances, and recent losses of life indicate that the problem of safety is no nearer solution now than it was 20 years ago.

THE recent tragic sinking of the British submarine M 2, with a loss of 62 lives, brings to the fore again the old problem of submarine safety. Following disasters such as the M 2, and the loss of the American S-4 and S-51, with their appalling cost in human life, inventors have been prolific in producing ideas intended to prevent recurrence of such tragedies.

Yet not one of these ideas has solved the problem—at best, they have merely palliated it. The M 2 was a submarine of the latest type. It was designed to carry an airplane in its decks, and as the first of its type was played up in the pages of MODERN MECHANICS AND INVENTIONS an issue or so ago. Its men were equipped with the official Davis Submarine Escape Apparatus—a mechanical lung which was supposed to enable the men to rise to the surface, breathing a supply of artificial air, in case of trouble.

Not a man escaped. In an emergency the lung failed them. Perhaps the escape locks were blocked; perhaps the compressed-air apparatus, on which their escape to an ex-

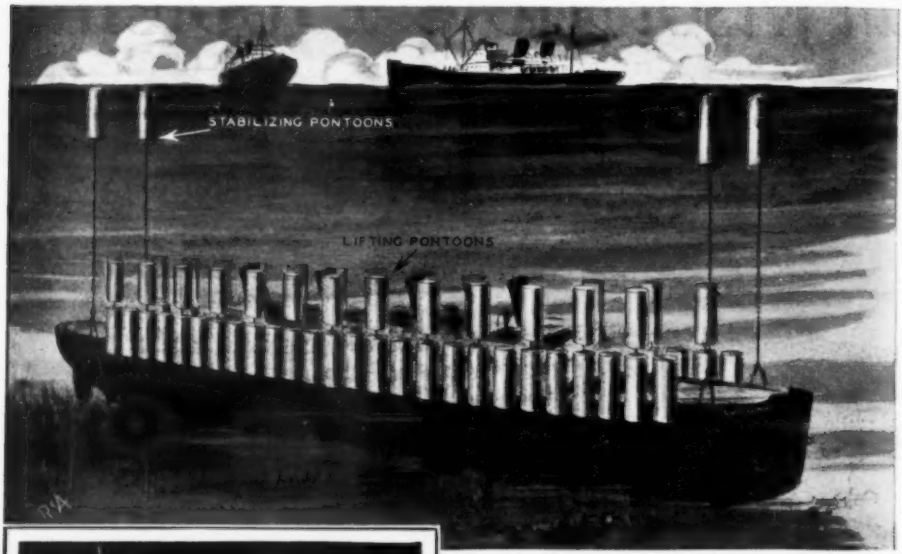

PORTABLE ESCAPE HATCH LOWERED TO SUB CLAMPS ON HATCH THROUGH WHICH MEN CLIMB TO BE LIFTED ONE BY ONE
ESCAPE HATCH BUILT INTO SUB UNPOPULAR WITH DESIGNERS ON ACCOUNT OF WEIGHT

Built-in escape chambers do not find favor with submarine designers on account of the extra weight they entail. Portable escape chambers lose much time getting into action.

an Insolvable Problem?

Top photo shows the British submarine M 2, which sank with a loss of 62 lives. Center picture is taken from a British film, depicting use of the Davis Submarine Escape Apparatus, or artificial lung, which was relied upon to save the lives of entrapped men. Bottom photo shows man with lung attached, emerging at the surface after a practice ascent.

Entire Hull of Lusitania Could Be Raised for $500,000, Says Mr. Reno



This is the method proposed by Capt. Jesse Reno for raising the hull of the Lusitania, employing his system of vertical pontoons, at an estimated cost of $500,000.

Capt. Reno's salvage company has successfully reclaimed wrecks in the Baltic Sea, on concession from the Esthonian government. Top photo shows battleship "Slava," sunk in 40 feet of water, reclaimed by Reno methods. Center picture gives view of one of the pontoons used in raising the hulk; bottom photo shows ship after raising.

tent depended, did not function. No one really knows.

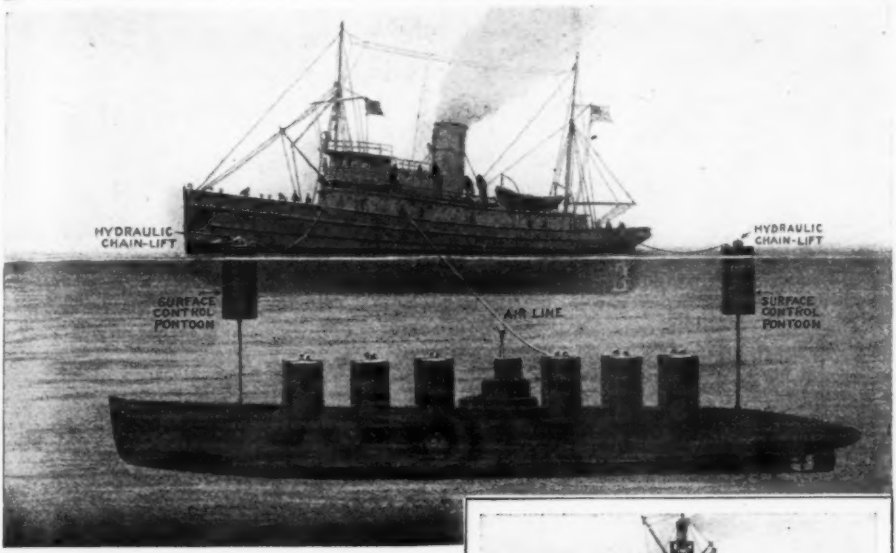
The Momsen escape lung, used by the United States Navy, is very similar to the Davis apparatus. In addition, our government has experimented with escape chambers built in as part of the submarine, through which men can emerge when wearing the lung, and with a portable escape chamber, to be lowered from a ship above the stranded submarine, clamped to an escape hatch where the men can climb into it, and then lifted up to the surface—very much like an under-water elevator.

Designers object to the built-in escape chamber on the grounds that it adds excessively to the weight of the submarine. An under-water vessel must be perfectly balanced, so if an escape lock is added to the forward portion of the ship, an equal weight must be established to counterbalance it at the rear. A submarine is regarded as a stripped-to-the-bone war weapon, and attachments which hamper its efficiency are frowned upon by naval men.

The portable escape chamber is satisfactory under ideal conditions, but it cannot be used until the stranded submarine is located. It would have been useless in the case of the M 2, whose location on the sea bottom was not known until several days had elapsed and the men had drowned.

To locate stranded submarines, devices such as that illustrated on page 54, in which a coiled flexible cable attached to a buoy is fastened to the submarine's side, to be released and floated to the surface in case

How Reno Vertical-Pontoon Method Could Raise Sunken Submarines



How Capt. Reno's vertical pontoon salvage method would work in the case of a submarine, such as the M 2. Surface pontoons enable the buoyancy of the wreck to be controlled, so that one end does not rise faster than the other.

of danger, have been frequently suggested. Through the tube air could be pumped to keep the men inside the sub alive. The position of the buoy on the water's surface would mark the spot where the ship sank, and speed the work of rescue.

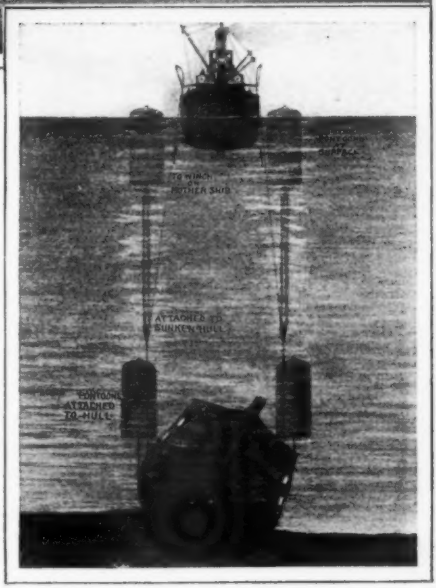
Admitting that this idea is practical, Navy men nevertheless do not look with favor on it, claiming that depth bombs would set the device loose, betraying the submarine's location to the enemy in case of war.

Italians make use of a modified escape-chamber, as illustrated on page 54. It consists essentially of a tube within the hull of the submarine, pointed up through the deck. Into this tube a man enters, wearing a mechanical lung. Compressed air is admitted until outside water pressure is equalled, and he is shot out into the sea, to emerge at the surface or to enter a similar tube on a rescue sub lying alongside.

The job of raising a sunken submarine is entirely divorced from the problem of saving its occupants. The pontoon system, in which huge metal cylinders are sunk beside the vessel, attached to it, and then blown out with compressed air, floating the sub, is still the favored method.

An improvement in this method, however, has recently been suggested by Jesse W. Reno, whose success in salvaging sunken vessels entitles his system to serious consideration.

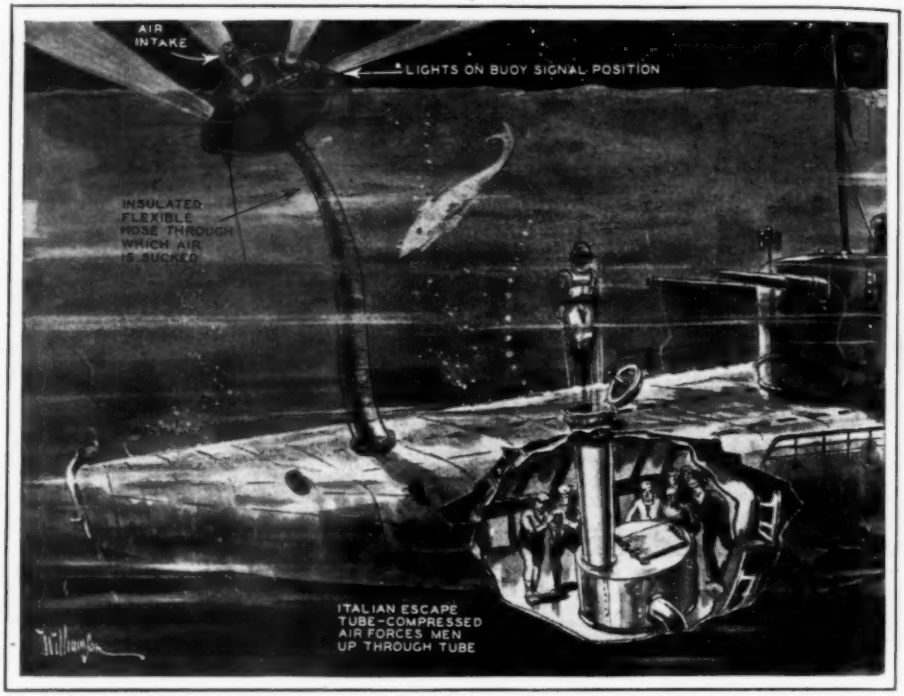
Mr. Reno makes use of vertical pontoons



Wrecks can be righted by means of block and tackle.

instead of the usual horizontal type. They are open at the lower end and have constant lifting power. A few years ago he demonstrated their efficiency in a mid-winter salvage of the 500-ton coast guard cutter *Scally*, which sank in Long Island Sound to a depth of 65 feet. Although operating from an ordinary derrick lighter, and through one foot of solid ice, Reno succeeded in re-floating the *Scally*, a feat widely reviewed in the press.

Navy Frowns on Buoy-Release, Fearing It Would Aid Enemy in War Time


AIR INTAKE
LIGHTS ON BUOY SIGNAL POSITION
INSULATED FLEXIBLE HOSE THROUGH WHICH AIR IS SUCKED
ITALIAN ESCAPE TUBE—COMPRESSED AIR FORCES MEN UP THROUGH TUBE

The buoy-release for submarines, consisting of a flexible tube with a float carrying lights to warn of its position, is the invention of Willard Truitt, of Jeannette, Pa. Naval officers frown on this idea because of their belief that depth charges in war would release the device, betraying position to the enemy. The escape tube inside the hull is the method used by the Italian navy. Men are blown through the tube by compressed air.

The Simon Lake expedition to recover treasure from the *Lusitania,* described in our February issue, is a less ambitious proposal than Mr. Reno's plan, advanced some time ago, to raise the entire vessel. Now, with the Cunard Company abandoning its plans for the construction of a gigantic super-liner, owing to financial difficulties, Capt. Reno renews his suggestion that the *Lusitania* be raised from her bed, instead of being merely stripped of her treasure.

"A staunch vessel like the *Lusitania,* with a hull shaped out of one and one-half inch plates, suffers little from exposure to deep sea conditions," says Capt. Reno. "Under high pressure, sea water allows less disintegration, in fact, than the surface elements. There is no doubt that the *Lusitania* can be floated and reconditioned. The principal consideration at this time is whether her reconditioning is economically expedient."

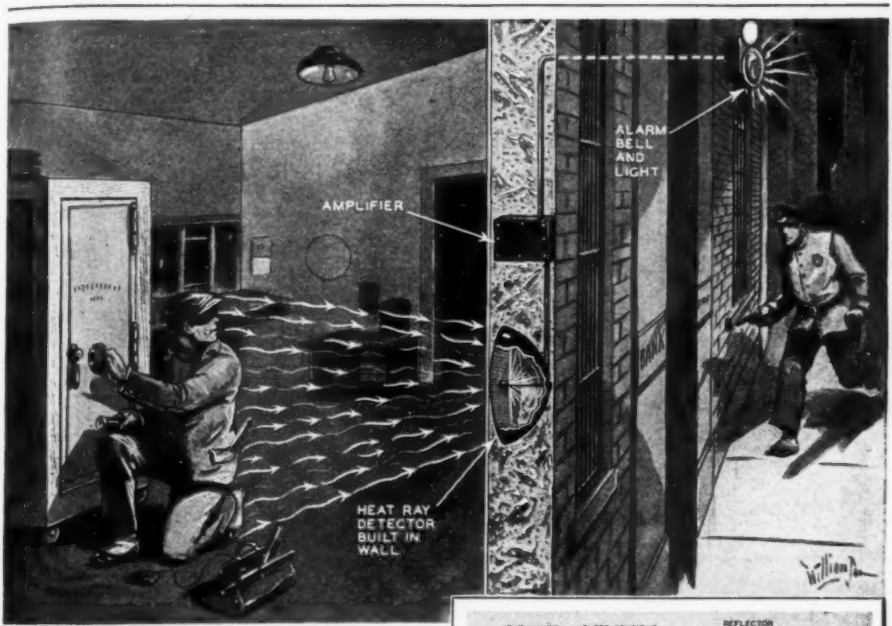
On a rough estimate, 100 pontoons, each with a lifting strength of 200 tons, would be sufficient to raise the *Lusitania;* thus a salvor would have at his command about 20,000 tons to lift a deadweight of 15,000 to 18,000 tons of submerged ship. (The *Lusitania's* displacement is about 31,000 tons.) At $4000 each, the cost of the pontoons would amount to $400,000. Miscellaneous equipment would add another $100,000. Hence, for an initial outlay of about $500,000 the *Lusitania* could be floated, towed and anchored in a safe harbor.

The method he proposes for the *Lusitania* is a modification of the one employed to raise the coast guard cutter *Scally.*

"To raise a ship of any size I employ two sets of pontoons, one attached directly to the ship portholes and the other at the surface. Thus, with a wreck as big as the *Lusitania,* I would attach about 92 pontoons directly to the hull—48 on each side of the ship—and keep eight stabilizing pontoons near the surface. By this method the lower set of pontoons is made to bear about 90 per cent of the load, which is not quite enough to raise the wreck.

"The 10 per cent balance of power rests with the eight stabilizing pontoons, which are only partially filled with water. Slowly displacing the water with air, we increase their buoyancy steadily until they barely manage to lift the wreck. Thereafter the ship is hoisted foot by foot as corresponding small amounts of air are pumped into the stabilizing pontoons."

Heat Waves Set Off New Thief Alarm

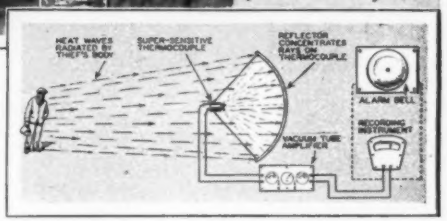


"Heat radio" to detect thief is built into wall and covered with grill to make it inconspicuous, as illustrated in drawing above. Heat rays set off alarm to call policeman.

THE heat from a burglar's body, even the gentle warmth of his breath, may now be detected by science's latest contribution to crime prevention, the "heat radio."

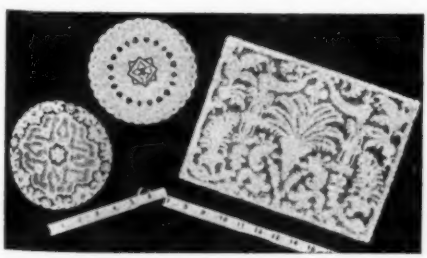
The heart of the "heat radio" is a very tiny and very delicate thermocouple, which is mounted at the focal point of a large metallic reflector. This reflector, shown in the accompanying illustration, collects the feeble heat waves and concentrates them on the super-sensitive thermocouple.

An amplifier connected to the thermocouple amplifies the current generated about one million times, making it strong enough to operate a recording instrument at police headquarters or an alarm bell.



Reflector concentrates heat waves on super-sensitive thermocouple, current generated being amplified to operate alarm.

Imitation Lace Doilies to Decorate Table Now Made From Cellophane



These attractive cellophane doilies, resembling lace, prove especially attractive for tables and dressers in the home.

CELLOPHANE, which has been used in wrapping everything from common pins to tires, is now manufactured as an aid to the housewife and hostess. Cellophane doilies which resemble lace strikingly and which may be used in the same positions as lace, are now on the market.

These doilies come in several different sizes and shapes, varying from small circular ones slightly over six inches in diameter, to large elliptical doilies well over a foot in length. Several styles are available, some for dinner usage and others for card tables. Three attractive designs are shown in the photo at the left. All manner of intricate designs are available.

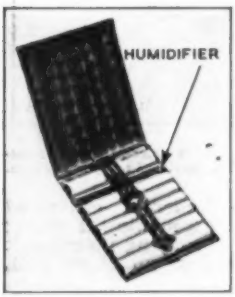
Latest for Housewives—Radio in the Kitchen Cabinet

Radio receiver, neatly concealed in the kitchen cabinet, brings to the housewife latest cooking recipes as well as the latest song hits to keep her cheerful on the job.

THE last word in modern equipment for the kitchen would make Old Mother Hubbard turn over in her grave. This modernity is nothing less than an all electric broadcast receiver built into a kitchen cabinet, as shown in the accompanying photo.

Concealed neatly just behind the table, and finished in harmony with the rest of the cabinet, the set is easily accessible, always ready to tell the housewife the latest cooking recipes and the latest song hits to keep her cheerful. The apparatus is of the latest design, reproducing the programs with the utmost fidelity.

Humidifier for Cigarette Case



Humidifier, made from glass tube filled with moistened cotton, fits in case as shown here.

CIGARETTES have a way of drying out in a cigarette case, so manufacturers are now making a special humidifier which will keep the smokes in a perfect condition. It is made of a length of ordinary glass tubing filled with moistened absorbent cotton. The humidifier takes the same space as a cigarette in the case.

Learn Craftsmanship When Young

THE proper age to train children to use their hands was declared by scientists to be between the ages of five and nine.

Dexterity of hand requires not only ability to move the muscles of hand and arm precisely but also the development and training of what psychologists call the muscle sense. This muscle sense is known to be capable of as much development as sight, hearing or other senses, but it is found that the training must begin at an earlier age in order to be effective.

Electric Pencil Writes in Gold

AN all-electric pencil, recently introduced, writes with pure gold on any surface, making it possible for the owner to write his name on his luggage and other possessions. The pencil has an electric element which heats the point, and a special gold foil is placed over the surface to receive the lettering when writing.

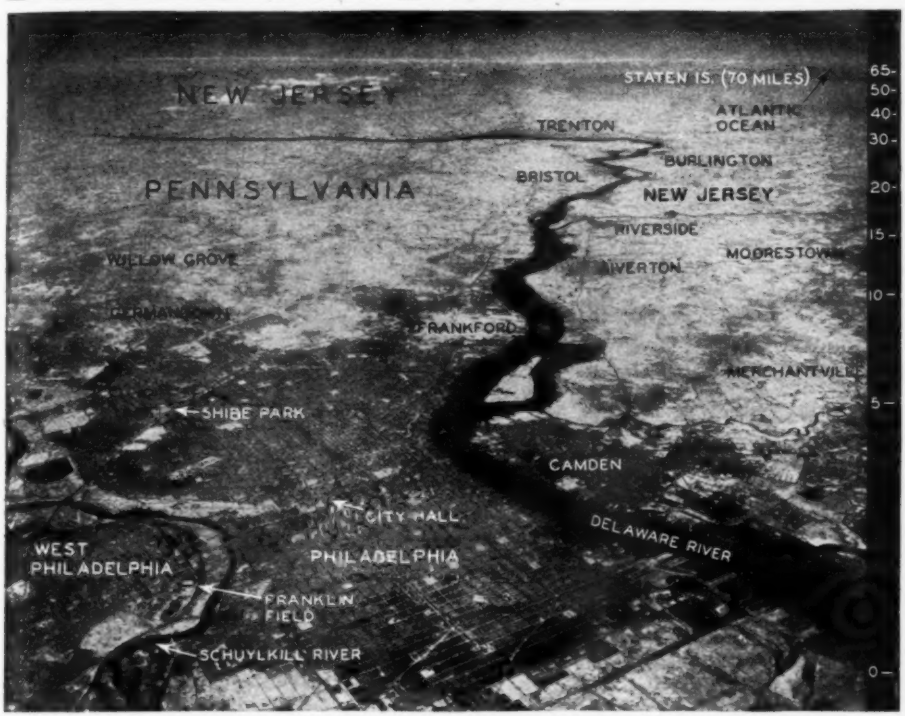
Heated point of electric pencil impresses gold of foil in letters on articles to be marked.

Carry Extra Passenger on Go-Cart

ADDING a seat for an extra passenger in a baby's go-cart is simply a matter of laying hands on an old discarded baby swing and suspending it from the go-cart handle as illustrated in the accompanying photo. A pair of hooks, made preferably from fairly thick strap iron, should be attached to the back of the swing. These hooks are then placed over the handle bar, and the passenger is ready to ride.

Extra seat, made from old baby swing, is suspended by hooks from handle of the go-cart to carry extra passenger.

AERIAL Camera Has 70-Mile Range



A milestone in the art of aerial photography, this remarkable shot was taken at a height of 20,000 feet with a new camera developed by Army Air Corps. In the foreground can be seen with startling clarity the cities of Philadelphia and Camden, while Staten Island and the Atlantic Ocean, 70 miles away, stand out distinctly in the background.

ALL records in the field of aerial photography were shattered recently when the U. S. Army Air Corps demonstrated a new long distance camera, making the remarkable photo shown above.

A revelation in camera work, this photo, made from a height of 20,000 feet, or about 3 4/5 miles, covers a range of approximately 70 miles. In the foreground of the picture are to be seen the entire cities of Philadelphia, Camden and Trenton, with Staten Island, N. Y., in the background, 70 miles away.

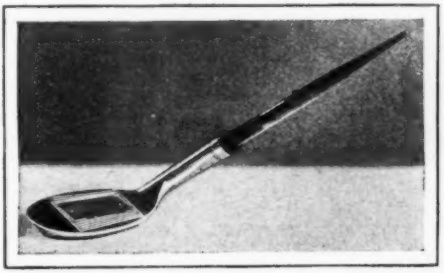
The camera is described as having five lenses, set at 140 degree angle, so that at a height of 15,000 feet a width of 15.3 miles can be covered.

Cellophane Used for Movie Film

CELLOPHANE, most commonly used to keep perishable commodities fresh and sanitary, is soon to be pressed into service to supplant celluloid in moving picture films. Foreign experimenters are conducting experiments along these lines, but so far they have met with serious obstacles.

Golf Club Makes Desk Pen Holder

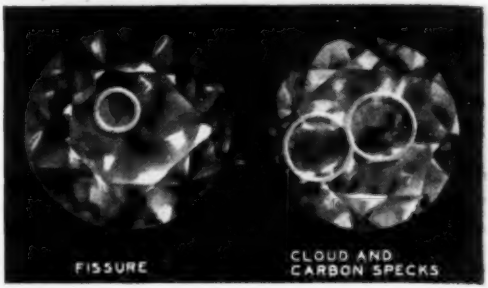
HEADS of golf clubs can not only swat balls, but can also serve as ornamental desk pen holder, as the photo below testifies. All you need to do is remove the handle and drill out the socket of the head, making it just large enough to hold the pen.



Head of golf club, removed from handle, is drilled out to make ornamental desk pen holder, as shown here. Collar should be added to make a snug fit for the pen.

How Science Detects

Under this binocular microscope, synthetic jewels immersed in a refractive liquid betray curved lines and bubbles.



These diamond flaws are revealed under a microscope. Flawed areas are within the yellow circles.

Even though you may not own any precious stones, you'll be interested in this authentic explanation of the scientific methods used to detect fakes; and if you do have a diamond or ruby or emerald, you'll be interested in the practical ways explained here by which you can prove whether it is genuine or not.

MILLIONS of dollars annually—how many no one knows—pour from the hands of the public into tricksters' pockets for reproductions, imitations, treated and synthetic stones which, if genuine, would be worth far more than the seemingly moderate prices asked.

Many thousands of dollars worth of synthetic stones are palmed off upon American travelers in the Orient each year as genuine rubies and sapphires.

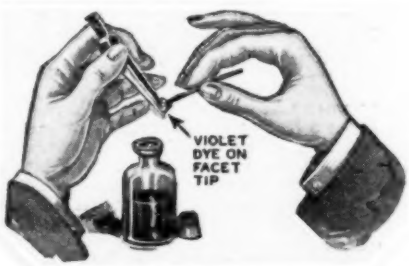
In the better jewelry stores through the country you may feel assured, however, that the jeweler fairly represents his goods. But sometimes even the jewelers are tricked into buying stones that are not the rare jewels they seem to be.

Recently an effort has been made to bring to the jewelers of the United States a "university extension course" in gems.

In Southern California a few months ago several jewelers got together to discuss the idea of having such expert instruction made available in the United States. As a result a lecture course in "Gemology" was offered at the University of Southern California, by Robert M. Shipley.

So, it was to this expert in jewels that

Triplets and doublets can be detected by soaking the suspected stone in alcohol, which will loosen the binding cement and cause gem to separate into units.



Occasionally violet dye is applied to the culet, or small bottom facet of a diamond, to give it a blue-white appearance. Such faking is usually confined to itinerant peddlers.

Fake JEWELS

by JAMES BOWLES

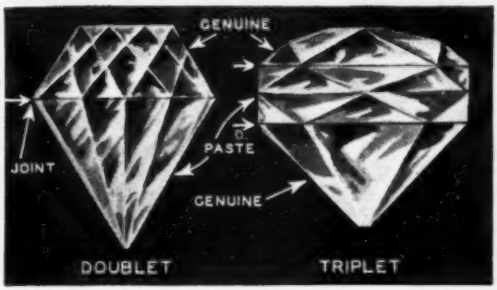
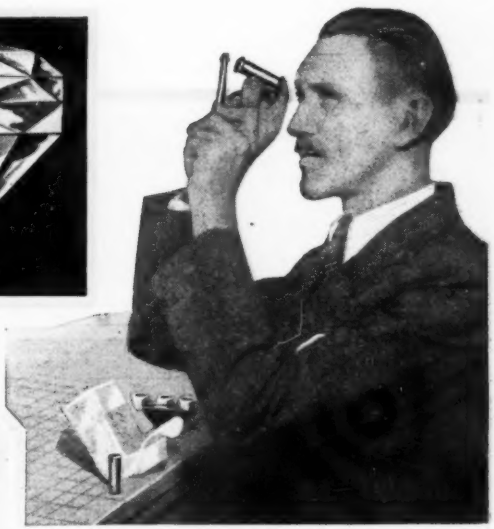
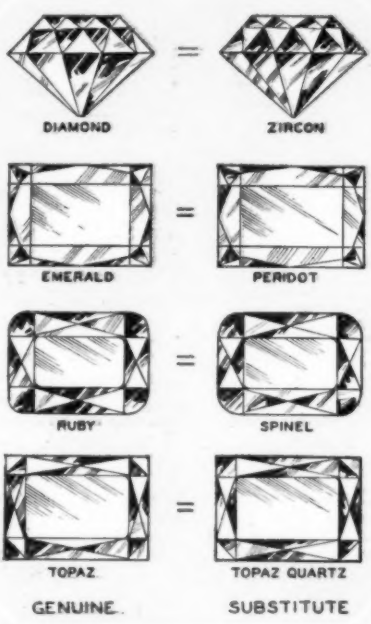


Diagram shows how doublets and triplets are built up. Part of a stone like this is genuine; the rest is paste.



Robert M. Shipley, gem expert, examines a stone through the dichroscope. True rubies, sapphires, and emeralds give off two colors, such as blue and yellow, when viewed through this device. Spurious stones give off but one color.



Four popular precious stones are arranged in a column at the left; opposite them appear the more usual substitutes.

I took the question, "How can the public detect fake jewels?"

"I understand," I said, "that the country has been flooded with spurious stones and that many of these can be detected by simple tests. Can people protect themselves against the substitutes that sometimes are offered as diamonds, against 'built up' stones (doublets) and the like? Can you give them a few rules for detecting the outstanding fakes?"

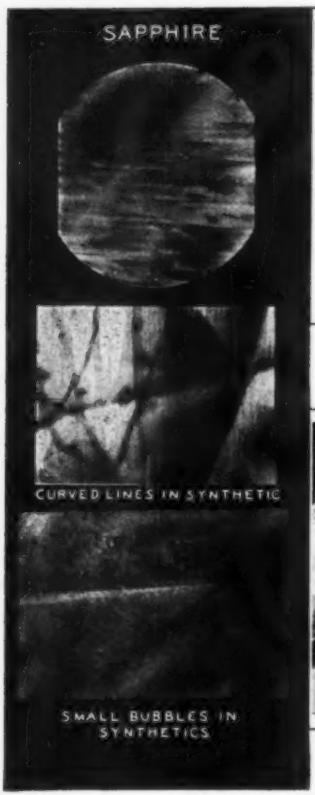
In reply, Mr. Shipley took me into his Los Angeles laboratory. There I saw several instruments used to separate the wheat from the chaff, some of which are not even in common use among jewelers. A few, photographs of which are reproduced with this article, are available in many reputable jewelry establishments, and with them, by following the rules I shall set forth below, you may detect your own fakes without any expert assistance. Some tests may be made without the aid of any instrument.

"First," Mr. Shipley said, "I think I should lay some background. Six stones finding popular favor today are the diamond, ruby, sapphire, emerald, zircon and spinel. The ruby and sapphire really are the same stone, one red and the other blue. The jewelry stores carry thousands of synthetic spinels and synthetic sapphires of various colors sold, usually, under some trade name.

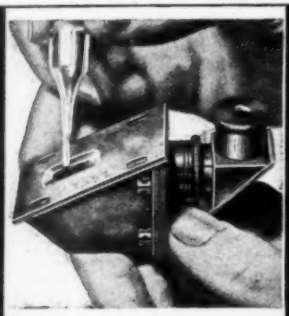
"So, it sometimes is difficult for experts to detect the genuine from the spurious."

Transparent stones, Mr. Shipley explained, are more confusing than the non-transparent varieties because nearly every transparent stone occurs in a colorless variety. That is, in its chemical form it has no color and derives color from some

Bubbles and Cracks Betray Synthetic Stones Under Strong Microscope

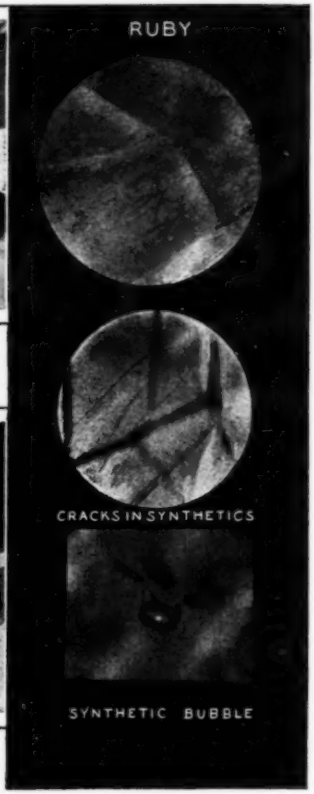


This column shows how true and synthetic sapphires appear through the microscope. The top illustration shows a genuine sapphire. Curved lines betray the synthetic stone in the middle picture, while the bottom photo shows itself to be synthetic because of the numerous bubbles.



Here you see small refractometer on which is being placed a saturated solution of methylene iodide for testing refraction of small stones.

A common method of faking diamonds is illustrated above. A zircon, which is a comparatively inexpensive stone, is used as the substitute. Zircons usually are yellowish or brownish in color, but the application of heat will drive off the color more or less permanently so that the stone can be pawned off on the unsuspecting as a genuine diamond at approximately 2000 per cent increase in value.



This column of microphotographs shows real and synthetic rubies. Top picture is the genuine ruby; below it is a synthetic stone betrayed by the cracks running through it, and the bottom photo shows a bubble appearing only in synthetic stones, by which they can be detected.

impurity. Thus, sapphires appear in a dozen colors. If red, the sapphire is called a ruby, because it has been so called for centuries.

In the yellow stones we have, among others, topaz quartz and oriental topaz, which is topaz-colored sapphire. The only substitute for diamonds are colorless zircons and sapphires. Scratching with a diamond is the simplest test here, as a diamond (10 in hardness) will scratch any stone except another diamond. Sapphires are nine in hardness and zircons 7½.

"Of course," said Mr. Shipley, "everyone is interested in diamonds. Nearly always a diamond is sold under a bright reflected light and one need only carry it to the sidewalk and examine it in diffused light to determine whether it is a diamond, or perhaps a sapphire, or a zircon. If the stone is well cut, and a dead center appears through the crown, it usually is not a diamond.

"The zircon more closely resembles the diamond as it has a high refractive power and almost as much dispersion, or ability to break light up into the several colors of the rainbow.

"In fact, the dispersive power of the diamond and zircon can be used as a test by holding them in the sunlight at a window. There will be reflected from them upon the ceiling the myriad colors of the rainbow, and these distinguish them from the sapphire. The simplest scientific tests between the diamond and zircon are a test on the refractometer, or a simple method of looking carefully at the back facets of the stone with a powerful magnifying glass—when these back facets will appear 'doubled' in the zircon but unchanged and single in the diamond.

Dyeing Diamonds Is Common Stunt of Fakers to Greatly Enhance Value

Green garnet, an inexpensive substitute for jade, cannot be scratched by a rat-tail file. True jade is soft and easily scratched.

Sometimes yellow diamonds are dyed in violet glycerine to give them a blue-white appearance, increasing their value. This coating can be removed by soaking the diamond in alcohol. Stones are sometimes dyed in other solutions which can be removed by boiling in sulphuric acid.

This stone proves to be genuine, under the microscope, because of the white spots inside the bubbles. Compare with photo below.

Black bubbles definitely prove this stone to be synthetic.

"As simple as it is to test a zircon, many jewelers and brokers have been tricked recently into buying or making loans on zircons from Ceylon and Siam, thinking them diamonds. When you consider that a $25 zircon would be worth $500 were it a diamond, you can appreciate the loss this represents. The colorless zircon used to imitate the diamond originally was yellow or brown, but heat is used to drive the color off more or less permanently.

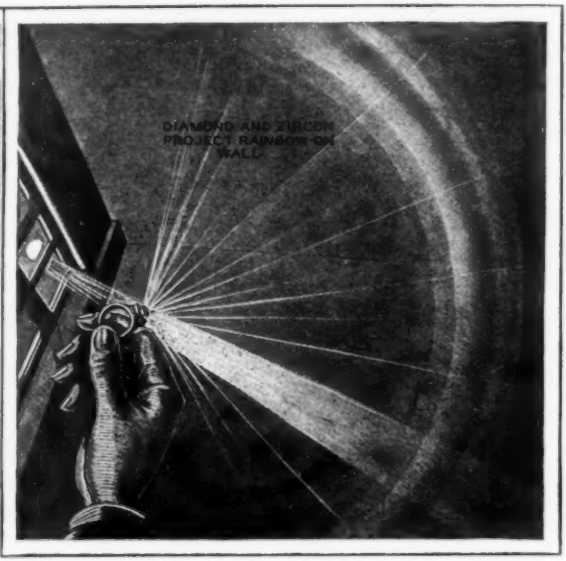
"The public has been taught to want blue-white diamonds. So thoroughly have they become 'blue-white conscious' that diamonds of other colors are comparatively unsaleable. Thus, there is often faking of diamonds by putting a touch of color at the culet, the small bottom facet, or around the girdle. A violet dye or, in cruder instances, ink may be used. The purchaser can detect these easily, either with the naked eye or with the aid of a glass. If the girdle is covered in the setting, the stone may be removed for examination.

"Sometimes yellow diamonds are immersed in a coat of violet-dyed glycerine. This can be detected by soaking the stone in alcohol, although more recently there have appeared yellow diamonds turned blue-white by soaking in some secret solution, the chemical analysis of which I have been unable to determine. Boiling in sulphuric acid will remove this coating.

"Occasionally diamond doublets appear," Mr. Shipley explained. "If you suspect a doublet, you need only scratch its back with another diamond. If it scratches, you may be sure either a form of rock crystal or a sapphire has been cemented to the crown. This sort of trickery enables fakers to use up thin stones, thus giving them added value.

"The doublet also may be detected by observing it under water or in some refractive liquid placed in an opaque white vessel. You should look obliquely at it from several directions. If you examine the girdle under a strong lens, the joining of the layers often is visible. Or, as a last resort, boil the stone in water or soak it in alcohol or chloroform. The cement

Diamond and Zircon Refract Rainbow on Wall, While Sapphires Do Not



A true emerald can be distinguished from an imitation by placing a drop of water on its surface. A genuine emerald, being a non-conductor of heat, will hold the drop as a globule, while upon an imitation the water will spread rapidly. A simple test for diamonds and zircons is to hold them in the sunlight at a window. If genuine, they will reflect a rainbow on the ceiling. White sapphires, sometimes substituted, do not have this ability.

will soften and the parts can be separated.

"By examining the doublet or the triplet through a microscope, the straight lines of the true stones probably will be found to run in opposite directions, thus revealing its innermost secrets. If, in the case of a triplet, glass has been cemented between the true stones, small bubbles will appear."

Sometimes the most daring fakery is attempted with emeralds and rubies which, when they weigh more than one and one-half carats cost more than diamonds. Emeralds have sold as high as $5,000 a carat and rubies up to $8,000 a carat. No synthetic emeralds ever have been made and stones represented as synthetic emeralds are sometimes synthetic sapphires or synthetic spinels. The most common substitute for the emerald, Mr. Shipley said, is glass!

"The emerald is rarely found without flaws," Mr. Shipley explained. "Flawless emeralds are museum pieces. Nearly all these stones are badly imperfect, so as a substitute glass can be almost perfectly reproduced, including the flaws.

"Also, there is a triplet sold as a crystalline or mascot emerald which has a top of beryl or rock crystal. The light green beryl, called aquamarine, is the same stone as the emerald but of slightly different coloring than the emerald green. The mascot emerald is composed of beryl top and bottom with a wafer-thin section of green glass or green transparent cement separating them.

"The fine, grass-green emerald is entirely different in color than other stones which are always more bluish or yellowish green. Other green stones approaching this emerald color lose their color under an artificial light.

"If you suspect it to be a doublet or a triplet, examine the stone with a strong jeweler's 'loop' under water. The thin line between the different sections can be easily seen. The green glass or colored cement will appear immediately below the girdle.

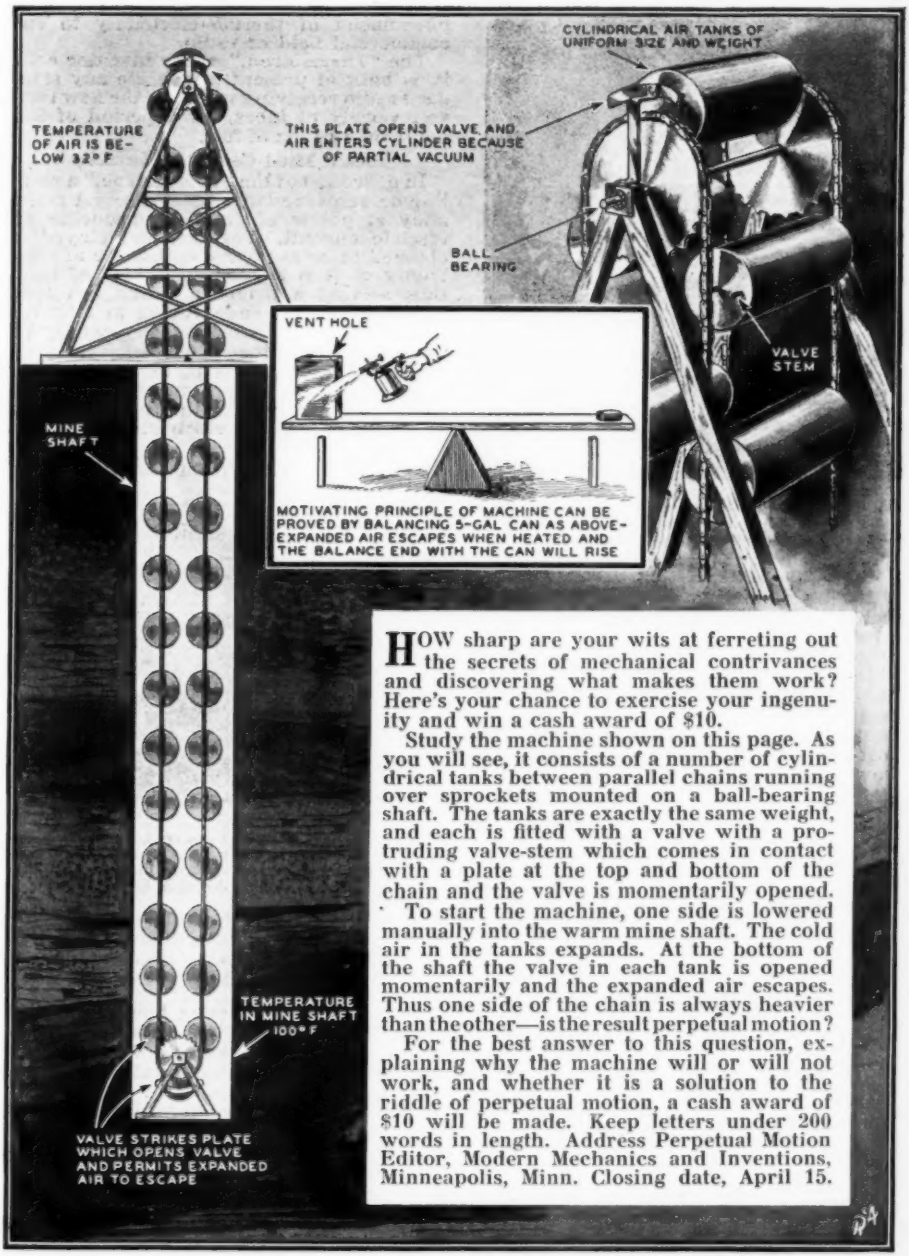
The Water Test

"The true emerald also may be easily distinguished from glass stones known as 'synthetic,' 'scientific,' or 'reconstructed' emeralds. These terms are used in an effort to deceive jewelers themselves. Here, one need only place tiny drops of water upon a true emerald and the suspect to determine the true from the false. The emerald, being a nonconductor of heat, will hold the drop as a globule while upon glass it spreads quickly. Both emerald triplets and glass may have the true emerald color.

"The hardness test with a file should not be used on an emerald as the stone is too fragile. The difference between the emerald and its glass imitations can be determined by examining them through a dichroscope, a small instrument which enables the eye to determine the two colors that constantly emerge from most gem stones. The naked eye sees these as a single color, yet through the dichroscope the emerald colors appear as blue and yellow and green. The reproduction will show only one color. This is an infallible test."

One can identify jade from the green garnet which has been sold as "African jade" by scratching these stones with a file. Jade scratches while garnet does not.

$10 for the Best Answer to the Question: *Will This Machine Work?*


CYLINDRICAL AIR TANKS OF UNIFORM SIZE AND WEIGHT
TEMPERATURE OF AIR IS BELOW 32° F
THIS PLATE OPENS VALVE AND AIR ENTERS CYLINDER BECAUSE OF PARTIAL VACUUM
BALL BEARING
VENT HOLE
VALVE STEM
MINE SHAFT
MOTIVATING PRINCIPLE OF MACHINE CAN BE PROVED BY BALANCING 5-GAL CAN AS ABOVE—EXPANDED AIR ESCAPES WHEN HEATED AND THE BALANCE END WITH THE CAN WILL RISE
TEMPERATURE IN MINE SHAFT 100° F
VALVE STRIKES PLATE WHICH OPENS VALVE AND PERMITS EXPANDED AIR TO ESCAPE

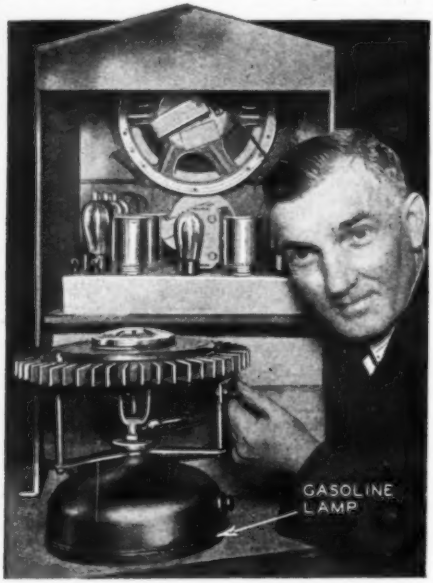
HOW sharp are your wits at ferreting out the secrets of mechanical contrivances and discovering what makes them work? Here's your chance to exercise your ingenuity and win a cash award of $10.

Study the machine shown on this page. As you will see, it consists of a number of cylindrical tanks between parallel chains running over sprockets mounted on a ball-bearing shaft. The tanks are exactly the same weight, and each is fitted with a valve with a protruding valve-stem which comes in contact with a plate at the top and bottom of the chain and the valve is momentarily opened.

To start the machine, one side is lowered manually into the warm mine shaft. The cold air in the tanks expands. At the bottom of the shaft the valve in each tank is opened momentarily and the expanded air escapes. Thus one side of the chain is always heavier than the other—is the result perpetual motion?

For the best answer to this question, explaining why the machine will or will not work, and whether it is a solution to the riddle of perpetual motion, a cash award of $10 will be made. Keep letters under 200 words in length. Address Perpetual Motion Editor, Modern Mechanics and Inventions, Minneapolis, Minn. Closing date, April 15.

New Device Converts Flame Into Electricity to Run Radio



With this new device secret metal alloy is heated at points of contact with kerosene or gasoline to generate sufficient voltage to operate 2-volt tube radio receiver.

A DEVICE which converts the heat of gasoline or kerosene directly into electric current has been invented by Dr. Otto Herman, of St. Louis, Mo., who claims that it is the first practical application of the phenomena of thermo-electricity to the commercial field of radio.

The "Thermotron," as the inventor calls it, is built at present to operate any standard radio receiving set, using the new two-volt variety of tubes, for a period of 160 hours on a gallon of fuel.

Heated Metal Generates Electricity

In operation of the "Thermotron," a gasoline or kerosene lamp heats a secret metal alloy at points of contact, producing an electric current. The metal employed is claimed to be as good a conductor of electricity as it is a poor conductor of heat, thus solving a problem which has long baffled scientists endeavoring to discover metals capable of working successfully on the principles of thermo-electricity.

Dr. Herman expects to extend his new discovery to the development of higher powered apparatus for the transformation of ordinary fuel into electricity.

Coaster Sled Rides Like Bike

WHAT amounts to a cross between a bicycle and a coaster sled was recently introduced for the delectation of winter sports enthusiasts. Designed for rapid travel down an incline or on either ice or snow, the device has a single runner with handle bars and foot-brake, as shown in the photo at right. The sturdy frame will easily support a 200-lb. man.

New coaster has bicycle frame mounted on steel runner.

How Is This Bulb Lighted?

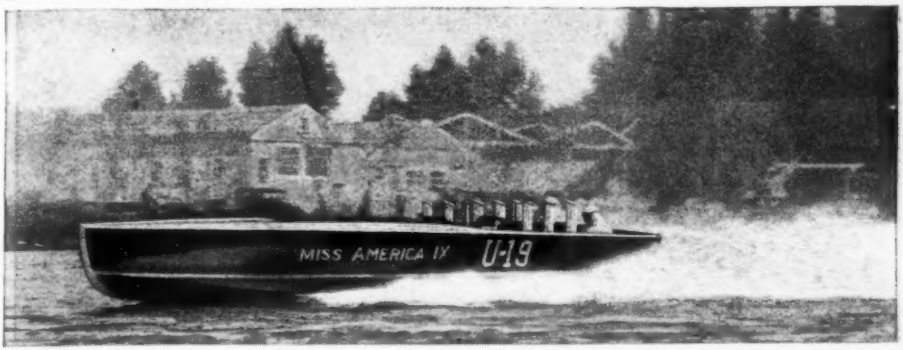
Question—How is this bulb lighted? Answer—By current from five foot antenna, which picks up three meter waves transmitted from oscillator overhead. Eggs are fried also, and body fever is created by high frequency currents.

DID you ever hear of such a thing—lighting an electric lamp without electricity? That, on the surface, appears to be the case of the glowing lamp shown in the photo above.

The truth of the matter, however, is that the light is brought to incandescence by means of three meter radio waves, which are radiated from the oscillator above the heads of the spectators.

The five-foot aerial to which the lamp is attached picks up enough of the current to set the bulb aglow. The oscillator, charged with 15,000 watts of power, lights up all bulbs within forty feet, cooks food in a few seconds, and raises body temperature one degree a second—all due to the intense electromagnetic field.

Fastest Boat Honors Now Back in U. S.



Above is shown the "Miss America IX" in which Gar Wood recently established speed record of 111.712 m.p.h., at Indian Creek, Florida, exceeding Kaye Don's record by 1.489 miles. Miss America is powered by two 12-cylinder motors.

HITTING off a cyclonic clip of 111.712 statute miles per hour in his *Miss America IX*, Gar Wood, renowned speed king of the waterways, recently shattered all existing records, even his own, and brought the boat racing cup back to the United States.

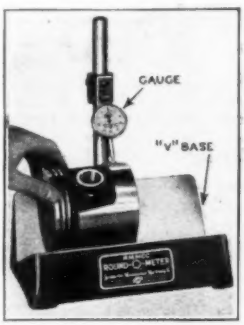
With the wind helping him over the measured nautical mile race course on the southward run at Indian Creek, Florida, Wood was clocked by electrical timing devices at 112.434 miles an hour, the elapsed time being 36.87 seconds. Northward bound, *Miss America IX* was slowed down to 110.989 miles per hour, the elapsed time here being 37.35 seconds.

In establishing the new record, Wood retrieved the cup for the United States from Kaye Don, of England. The Britisher's record of 110.223 miles per hour, established with *Miss England II* at Lake Garda, Italy, last July, was exceeded by 1.489 miles.

Miss America IX is powered by two 12-cylinder motors, developing 1200 h.p. each. Superchargers step the motors up to 1600 h.p. each at high speed.

New Tool Checks Roundness, Size

A NEW tool for checking roundness and size of objects such as pistons, bushings, sleeves, pins, and the like, of a diameter from three-fourths to six inches, is now available for machinists. Inaccuracies of a half thousandth of an inch can be detected with extreme rapidity and precision. In operation, the object is slid into the V-base of the tool, and a direct reading gauge then automatically takes the measurement. A dial registers sizes when part is revolved.



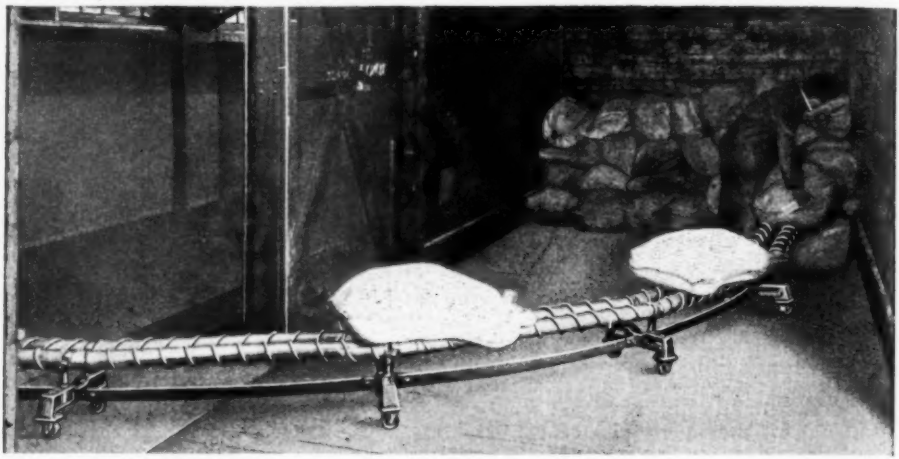
This gauge registers measurements of round objects revolved in the V-base. Size and roundness are automatically checked.

Test Your Observation Powers — Answer These Questions

Here are 25 questions, based on articles appearing in this issue of Modern Mechanics and Inventions, which it will be interesting for you to answer as a test of your powers of observation and memory. Read the magazine FIRST—then try your hand at the questions. The figures in parentheses after each question refer to the pages on which the information can be found.

What are the three present systems of television? (41)
Is matter destroyed when a house burns down? (49)
Do mechanical lungs ensure safety to submarine sailors? (51)
How can the body-heat of a burglar set off an alarm to trap him? (55)
What is an easy test for detecting an imitation emerald from a true one? (62)
How can an electric bulb be lighted without contact with a source of current? (64)
Does coal have to be mined to be converted into power? (69)
What institution gets the credit for the invention of slow-motion movies? (78)
What simple camera attachment would make a fortune for its inventor? (85)
How can a door be hinged to open on both right and left sides? (93)
What is the new industry of electronics? (102)
By what means can airplanes flying blind in fog or snow land in absolute safety? (110)
Why are fishermen terrified by the moray eel? (120)
How can television performers read music in the dark? (132)
How is it possible to take photos from the air without an airplane or a dirigible? (147)

Freight Conveyed to Any Part of Car on Spiral Tubes



Bags placed on revolving parallel spiral tubes are carried at a speed of 90 feet per minute direct to the spot where they are to be piled. Note casters which permit easy shifting of sections to any part of the car or warehouse.

Self-Accompaniment on Piano

AT LAST a way has been found to harness the power released by musicians addicted to foot tapping. By means of a new invention, called a "Pedipiano," shown below, the musician can accompany himself on the piano when he plays the fiddle. Striking the pedals sounds the chords.

Fiddler accompanies himself on piano by depressing pedals with foot, thus operating the keys of the piano, as shown.

A CONSIDERABLE reduction in the time and cost required for loading and unloading freight cars is afforded by the use of new portable and flexible loading equipment now being marketed under the name of "Kar Kit."

The equipment consists of sections of twin parallel spiral tubes that are constantly turned away from each other by a power head. Any commodity in bags, bales or bundles placed on the tubes travel away at a speed of 90 feet per minute, directly to the spot where the freight is to be piled.

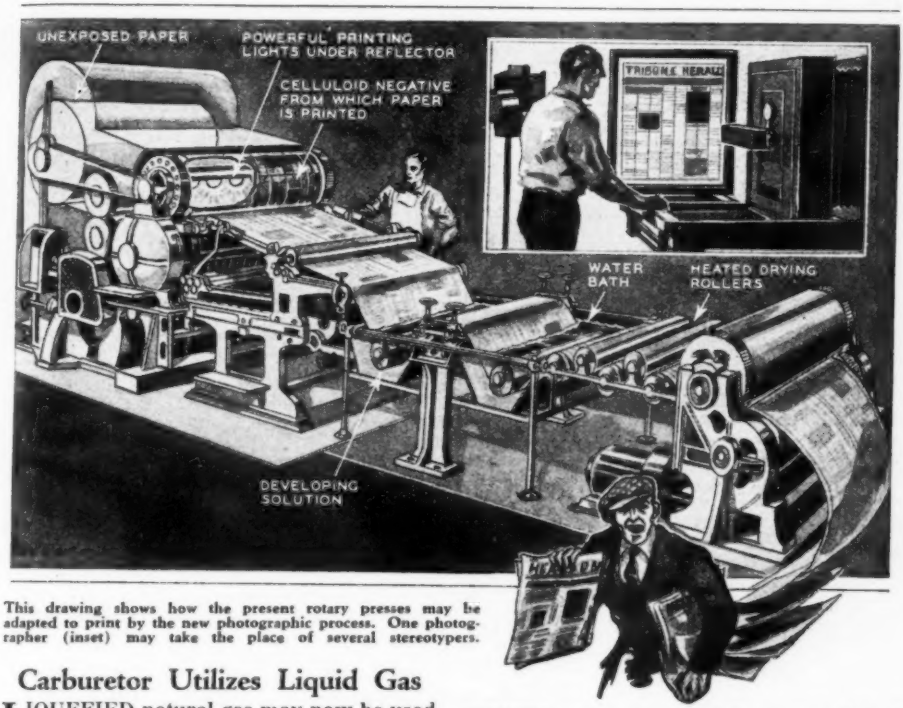
Mounted on casters, the sections, having flexible connections, are moved to any point of the car. Unloading is accomplished by reversing the forward spiral motion.

Waterproof Cover for Wrist Watch

EVERY year thousands of wrist watches are ruined when swimmers forget to remove their timepieces preparatory to the dive. To prevent these costly oversights, procure a three-inch length of thin tubular rubber from any drug store. Draw it on over the hand, then roll it out from the two ends over the watch. The result is a water tight covering, shown in the accompanying photo, which leaves hands visible.

Rubber makes water-proof cover.

Super-Speed PRINTING by Photography



This drawing shows how the present rotary presses may be adapted to print by the new photographic process. One photographer (inset) may take the place of several stereotypers.

THOSE who understand the properties of a new photographic emulsion believe that the day of printing by type will soon be past.

Printing is now slow and expensive. The cuts that go to make up magazines like this, cost several thousand dollars an issue, and a high grade of paper must be used if the magazine is to be kept attractive.

In place of using heavy stereotype plates and metal cuts, a new and cheap photographic emulsion has been developed which permits photographic impressions of great detail and clarity to be made at high speed on even the cheapest kind of paper.

The magic of modern chemistry has at last produced a cheap emulsion which is light sensitive without depending upon silver bromide.

Paper impregnated with this light sensitive material will be used on our printing presses and the rollers for printing, in place of carrying heavy lead plates of cast type, will carry nothing but transparent negatives with powerful electric lights showing through them.

The paper, issuing from a darkened chamber, will speed under the exposure roller and thence on to the developing solutions. From this point the paper rushes through a water bath and then through a series of electric dryers.

Carburetor Utilizes Liquid Gas

LIQUEFIED natural gas may now be used in place of gasoline to drive internal combustion motors, thanks to the invention of a new type of carburetor suitable for use on any standard automobile or airplane engine. The gas will cost but four cents a gallon.

Thomas Brooks demonstrating his liquid gas carburetor.

Long Distance Weather Forecasts Now Made By Machine

This intricate mathematical calculating machine shown in photo above was designed for studying facts of solar radiation which may lead to long distance weather forecasts.

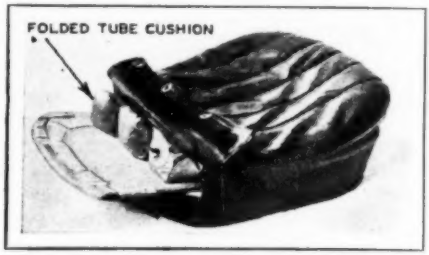
COMPLICATED weather forecasting computations can now be calculated automatically on the marvelously intricate machine shown at the left, the invention of Dr. Charles G. Abbot, secretary of the Smithsonian Institution. With it he expects to calculate such things as variations in solar radiation to determine if they occur in cycles, and thus to lay the foundation for predicting what our weather will be ten or twenty years ahead. The new invention is similar to conventional calculating machines, except that it is designed for a particular use.

Tunes in Radio Automatically

NOW you can select in advance any radio program from any one of half a dozen radio stations and have your set tune itself in automatically at 15-minute intervals. Choose the programs you want to hear in the morning, set the dials of the control device, which is run by clockwork, and without further attention on your part the radio will tune itself in on the desired broadcast at the proper time. A revolving cylinder carries knobs which make contacts every 15 minutes during a 12-hour period.

The cylinder is revolved by clockwork, the knobs closing switches to tune in desired stations at 15-minute intervals.

Tubes of Air Absorb Jolts



Tubular air cushions underneath the leather as shown here eliminate the bulging roll which has been a major objection to previous types of pneumatic upholstery.

CONSTRUCTED with one or more tubes specially constructed to lie in folds within an outer cover, pneumatic upholstery has been designed so that the weight carried is evenly supported by low air pressure. The folded tube arrangement does away with the roll which was the main objection to the original air cushion.

Special Auto Key Container

IGNITION, car door, and tire lock keys can all be accommodated in this new metal "Kar Key Kompact," keeping them separate from house and office keys. Keys fit conveniently inside the metal handle, which is so light that it does not damage the instrument board if left dangling from the ignition key. Many scratched instrument panels have resulted from key rings jolting against lacquered surfaces.

Car keys fold back into this metal handle, which is so light that it will not damage instrument panel if left dangling in ignition lock.

Swinging Pistol Holster Permits Quick Shot From Hip

Carried in new holster, gun is swung from hip as shown.

POLICEMEN who must be quick on the draw have a split second's advantage over their victim when wearing a new type of pistol holder which has recently been patented.

The function of the new holster is to make it possible, without removing the gun from the pistol case, to swing a six shooter or automatic into a firing position and shoot instantaneously. It also permits a faster and more efficient draw, as this action is two-thirds faster than with the present type holder.

With this swinging drop holster, the gun is suspended from the belt in a kind of swivel, as illustrated in the photo.

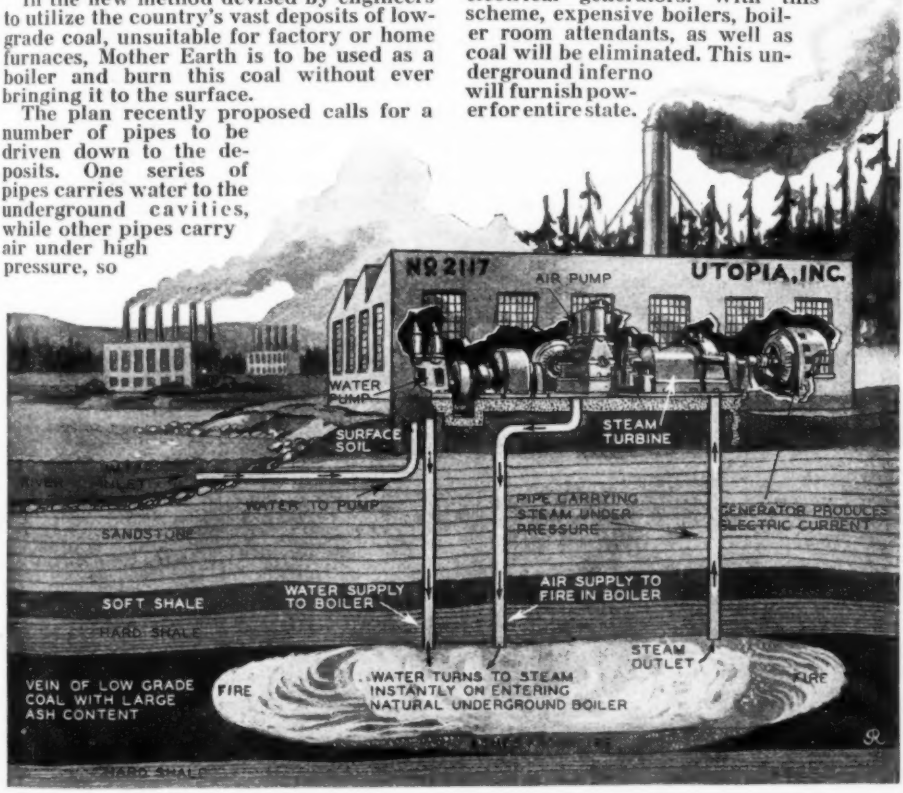
Low Grade Coal Deposit Makes Natural "Boiler" to Generate Electricity

VISUALIZE two million straining horses lashed to a load that would be one-eighth the weight of Mount McKinley and you will have some idea of the tremendous power that will be generated in the low-grade coal districts by the super-power stations of the near future.

In the new method devised by engineers to utilize the country's vast deposits of low-grade coal, unsuitable for factory or home furnaces, Mother Earth is to be used as a boiler and burn this coal without ever bringing it to the surface.

The plan recently proposed calls for a number of pipes to be driven down to the deposits. One series of pipes carries water to the underground cavities, while other pipes carry air under high pressure, so that the coal burning there will develop high heat. Still another series of pipes carries the steam generated to the power station high above on the surface.

At the power station, giant turbines, each producing 150,000 h.p., would permit the steam to expand and turn huge electrical generators. With this scheme, expensive boilers, boiler room attendants, as well as coal will be eliminated. This underground inferno will furnish power for entire state.



Fire burning in underground coal deposit generates steam, carried by pipes to 150,000 h.p. turbines in power station.

What Tomorrow's CARS

Phantom though it now is, 1940's automobile is already taking shape in engineering laboratories. Note the modified streamline cars shown in left foreground of this photograph, forerunners of design developments now taking place.

The automobile industry, always one of the country's most progressive, is today on the verge of astonishing changes in engineering design which are likely to make your next automobile so radically different in appearance that you'll hardly recognize it. Probable lines of development of tomorrow's car are here authoritatively presented.

PROFILES of automobiles, like profiles of women's hats, have a habit of changing swiftly and drastically in response to the whims of fashion.

This is perhaps the most significant observation carried away by the visitor to this year's automobile shows. For the profile of the typical 1932 automobile is so different from its 1931 predecessor that the dullest eye cannot fail to distinguish the new models on the streets.

The 1932 Profile

What has happened to the body design of the new cars? The most obvious change has been the cautious approach to streamline form. Windshields slope backward at a pronounced angle; outside sun visors which were conspicuous in most 1931 models have been entirely removed. Rear quarters have been rounded off, and in some instances fenders have been flared and "dead space" between fender and wheel filled in to achieve better streamline proportions.

For the moment, let's pass over the numerous advances in engineering such as automatic clutches, free wheeling, automatic starting, and so on, and consider what the single factor of body design holds forth as a promise for 1940's automobiles.

Automotive designers are generally agreed that the "tear drop" body—that is, a body conforming in shape to a drop of water, blunt in front and tapering off at the rear—is sure to come into general popularity. The new automobiles, cautiously, are approaching that ideal.

Practically all the large automobile manufacturers are experimenting with tear-drop automobiles. Many of them are being tested out on private proving grounds; many others, disguised under conventional bodies, are piling up mileage on the highways testing the efficiency of engines mounted at the rear, and of other mechanical changes which tear-drop body styles will necessitate.

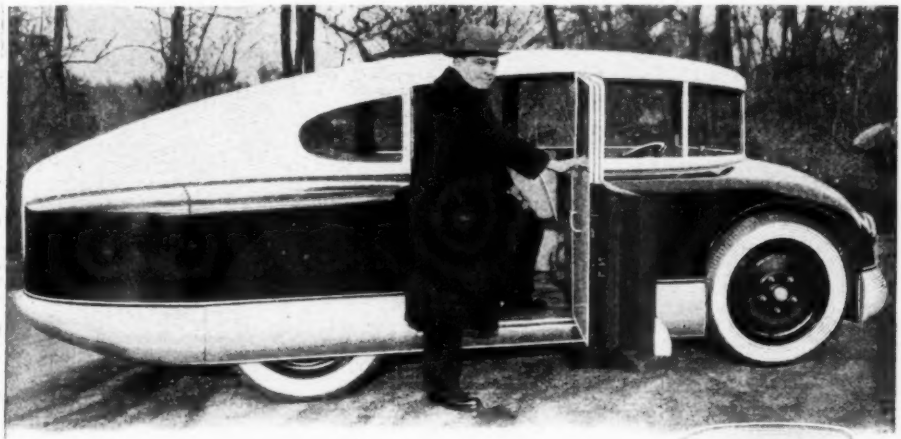
Today's Streamlined Examples

Only recently there appeared on the streets of New York two experimental automobiles which may be taken as an advance guard of tomorrow's cars. One of these is a four-wheeled model, the other three-wheeled. Both were designed by Capt. J. V. Martin, the famous airplane designer who built the well-known Martin bombers and other planes for the U. S. Army.

The four-wheeled car, a photo of which appears in this article, has a 34-horsepower motor installed at the rear which drives it

Will LOOK LIKE

by DONALD GRAY



This streamlined car with engine in the rear is the design of James V. Martin, noted airplane manufacturer. A bumper encircles the entire car, except at the side of the front wheels. Wheels are sprung individually with airplane shock cord.

at a top speed of 110 miles an hour, with an average gas consumption of 45 miles to the gallon. This phenomenal performance is mostly attributed to the minimized air resistance which the streamlined model has to overcome.

Speed tests on conventional cars have demonstrated the fact that simply by removing such obstructions as headlights and fenders, the top speed of a car can be increased some four to five miles. When one considers the fact that at high speeds practically the only resistance the car has to overcome (outside of internal friction) is air pressure, the true value of streamlining becomes apparent.

Cars Streamlined Underneath Too

In Capt. Martin's car, a continuous metal bumper encircles the base of the entire machine, except for a space alongside the front wheels required in turning. This bumper clears the ground by some six inches, and the entire riding compartment is scarcely more than half a foot off the ground. This low-slung center of gravity has two effects: it practically eliminates danger of overturning, and it makes possible a comparatively smooth surface underneath the entire car. Streamlining, in other words, must be continuous over the entire surface of the car. Each wheel in the Martin car has its individual spring. As a matter of fact, it is not a spring at all, in the orthodox sense, but rubber shock cord of the type long used in airplanes to absorb strains on the landing gear.

You have probably noticed the difference in riding qualities between the front and

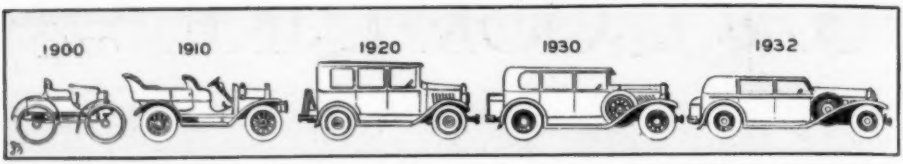
A removable hood exposes the engine in the rear, with screen-covered opening for the radiator fan. The 34 h.p. engine delivers 45 miles per gallon and gives a top speed of 110 miles an hour. Note rear-vision window in the roof.

rear seats of conventional motor cars. Most of the bounces and jolts are likely to affect the rear seat passengers, while the driver rides in perfect comfort. This is because the front seat is midway between the two axles of the car, where it is pretty well cushioned from jolts. In the Martin car, both seats are located between the axles, and this, in addition to the individual wheel suspension, is said to impart remarkable riding qualities.

Three-Wheel Design

The second car of Martin design is a three-wheeler whose most obvious novelty is the location of its door in the front. This arrangement gives it a closer approach to

Auto Profiles of Past 30 Years Show Increasing Use of Streamline Design



Profiles of cars the past 30 years show how streamlining has gradually come to the fore. The new 1932 cars practically all have sloping windshields with no visors projecting on the outside. The rear quarters are being rounded off.

the ideal tear drop form than any car yet designed. And for economy, this little car can have few rivals if it lives up to its advance notices. Eighty-five miles to the gallon of gas and a top speed of 75 miles an hour are promised.

Both of these streamlined cars have four-cylinder motors, with the transmission mounted in the rear of the car along with the engine.

Neither of these cars, of course, represents the ultimate 1940 design, but they are the first tangible evidence the public has had of the general trend of motor car design.

New Spring Suspension Styles

The entire system of spring suspension will be changed in tomorrow's cars. Springs will have no shackles and will, in fact, require no positive fastening to the frame, either by metal or rubber devices. This will leave them free to perform their suspension functions; they will no longer be required to take driving or twisting forces, as is at present the case.

Tires and wheels will be regarded as single units in the 1940 car. In fact, the wheel will be reduced to little more than a hub on which to mount a super-balloon tire that operates at air pressures of 10 to 12 pounds. Such tires are already on the market, developing out of the familiar "air wheel" which has proved so popular for airplane use. These tires, in conjunction with individually suspended wheels, will give new standards of riding smoothness unattained in the most costly present-day cars. The advantage of independent wheel suspension is that a wheel can absorb the jolt of a rut in the road without transmitting the shock through the entire chassis of the car.

Present automobiles universally use the four-stroke cycle gasoline motor. The two-stroke cycle motor, however, is being given careful study and may be used in the next decade's cars. Such motors can be made lighter and more compact than the four-cycle type, and can deliver high turning effort at slow speed which is required for rapid acceleration.

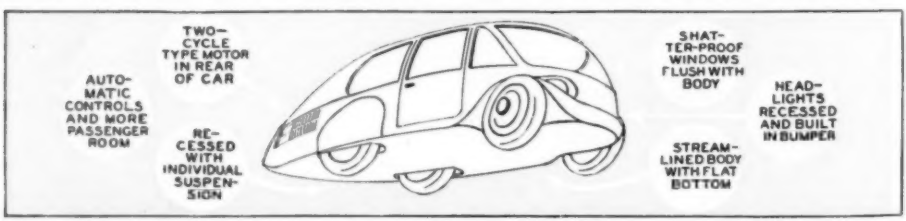
Why We Haven't Had Streamlined Cars

The Prince of Wales has for two years driven a streamlined car designed by Sir Denistoun Burney, builder of the British dirigible R-100. The car is very similar in its appearance to Capt. Martin's four-wheeler. Yet the British public has not yet fallen over itself in its eagerness to purchase this type of machine.

Why? Well, aside from initial expense, there is the objection that the public is not yet ready for cars of such bizarre appearance. And there is also the objection, advanced by some engineers, that streamline design is of negligible advantage on cars traveling at moderate rates of speed. This is perfectly true. When speeds approach sixty to seventy miles an hour, streamlining becomes tremendously important. Hold your hand out the window of a car traveling at this rate if you want some conception of the force exerted by so seemingly insignificant a thing as air pressure. Top speeds of sedans, it has been found, can be increased two to three miles an hour by so simple an expedient as closing all the windows!

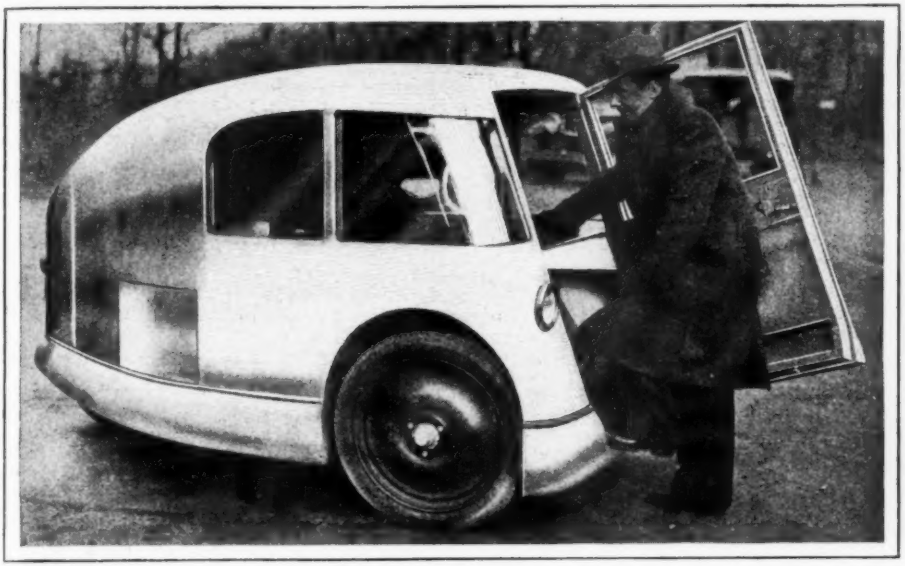
Advantages of Rear Engine Drive

But, though its coming will be gradual, in deference to the hesitancy of the buying public to invest in anything freakish, the tear-drop car is on the way. The single factor of moving the motor to the rear makes possible a body design with such unique advantages that it must eventually become universal. Heat and noise of the engine are *behind* the passengers, so that they can ride in comfort. Forward vision


TWO-CYCLE TYPE MOTOR IN REAR OF CAR
AUTO-MATIC CONTROLS AND MORE PASSENGER ROOM
RE-CESSED WITH INDIVIDUAL SUSPEN-SION
SHAT-TER-PROOF WINDOWS FLUSH WITH BODY
HEAD-LIGHTS RECESSED AND BUILT IN BUMPER
STREAM-LINED BODY WITH FLAT BOTTOM

Main lines of development on which automotive engineers are working are presented in the drawing shown above.

Three-Wheeled Car Has Most Perfect Tear-Drop Body Yet Designed



This three-wheeled car, with door in front, boasts an almost perfect tear-drop shape. It delivers 85 miles of travel on one gallon of gas, and can do 75 miles an hour at top speed with safety. It can be parked easily in small places.

becomes much less obstructed with the elimination of the long hood over which drivers must at present peer. That same engine can be better balanced at the rear. No long propeller shaft is necessary. This makes it possible to lower the frame of the car and smooth off its under parts.

Some of the developments announced on 1932 models will be applicable to tear-drop cars; others will drop by the wayside. For instance, many cars this year have announced X-type frames, in which the body members are braced by steel girders in the shape of an X between the members. Individual wheel suspension will eliminate the need for such rigidity; in fact, it will eliminate axles as we know them. Car frames will be built along entirely different lines.

But such advances as "startix," which cranks the motor automatically when the ignition is turned on, will be just as valuable in a tear-drop car as any other style. Likewise, free-wheeling, automatic clutches, and automatic gear shifts will always find favor. By the time the tear-drop car is commercially accepted, practically everything about it will be automatic—it will probably halt by itself at sight of a red light.

Motors in the tear-drop car will not be the multi-cylinder type that have gained such favor recently. The reasons for this are obvious: the space in which the motors can fit is limited, and compact designs, probably V-type, will win favor. Instead of being mounted lengthwise, motors at the rear will very probably be placed crosswise of the car, with obvious savings of space.

Cost of producing such cars need not be any greater than with present types. The probability is that costs will come down, since so many heavy parts will be eliminated. Once manufacturers are assured of steady demand, they'll not hesitate to re-equip their factories for quantity production—and that's the answer to low unit price and the reason why we get so much value for today's automobile dollar.

Of course, when we get our new tear-drop cars we'll probably have to learn the technique of driving all over again, because we'll be confronted with entirely different operating conditions. But that's part of the fun!

1940's AUTOMOBILE

will have, according to present trends:

Motor mounted in the rear of the car.

Streamlined "tear-drop" bodies.

Independently suspended wheels to absorb road shocks.

Super balloon (air-wheel) tires riding at 10 pounds air pressure.

Frameless chassis—that is, axles and heavy cross-members such as are now used will be eliminated.

Smooth riding qualities unequaled by any type of present-day car.

Elimination of motor and body noises and vibration.

Windowless House Has Perpetual Spring Atmosphere

Movable panels on the wall, each with a heating element behind it, demonstrate that if walls are kept at body temperatures, perfect comfort is obtained.

BUILT on the theory that if the walls of a house are heated to body temperature, there can be no loss of body heat by radiation, an experimental house recently built has succeeded in manufacturing perpetual spring climates to order.

As shown in the photo at the left, the walls are covered with a series of movable panels, with an electric heating element behind each one. With the walls heated to body temperature, it was found that the room was quite comfortable, even though the temperature of the air was as low as 60 degrees. Almost half the loss of body heat, resulting in sensations of cold, is accounted for by radiation.

Creeping Cells Heal Wounds

THE old theory that wounds are healed by dividing and re-dividing of living cells, producing new cells which fill up the wound, is challenged by experiments of Prof. L. B. Arey of Northwestern University. He has found that a number of apparently ordinary cells in the skin or other tissues near the wound slowly creep toward the cut and plaster it shut. New cells may be produced by cell division, but this does not happen in the cut itself or as a part of the direct repair.

Shapes Necktie Knots Perfectly

This shaper forms a perfect knot in neckties. Before tightening the knot, the shaper is removed.

A SHAPER which enables a necktie to be perfectly knotted every time it is tied is shown in the illustration at the left. The first part of the knot is made around the shaper instead of the fingers. Then the wide part of the tie is brought halfway through the knot as usual, but before tightening the shaper is removed from the top of the knot.

Wall Socket Recharges Flashlight

FLASHLIGHT dry cells can now be recharged when worn out by the use of a unit which fits into the base of the flashlight case. Simply plug it into the house lighting circuit and leave the current on until the dry cell is recharged and active once more. The amount of current consumed costs practically nothing. The recharging device is the product of a German inventor.

Worn out flashlight dry cells can now be recharged by plugging in on the home lighting circuit.

New Pipe Organ Has No Pipes

VACUUM tubes, of the type used in radios, take the place of pipes in a new organ designed by M. Coupleux, a French inventor. Note how much more compact is the instrument than the usual cumbersome pipe organ.

Vacuum tubes supplant pipes in this new compact organ.

Turn Your Maple TREES Into SUGAR

Tapping maple trees for sap is a simple process. An average tree yields 10 gallons of sap a season, which can be boiled down to a quarter gallon of syrup or two pounds of sugar. Large trees, as in photo above, will support two or more buckets. At left, gathering sap in Vermont woods.

THE sugar maple, chosen by thousands of home owners for its shade, has another advantage which people living outside the maple sugar area usually overlook. There is no reason why the trees in thousands of home yards and summer homes in the country cannot be tapped for maple sugar except that the home owners are not "maple sugar conscious."

"Sugaring" with one or two or a dozen good sugar maples can be done at practically no cost and without damage to the tree. Tapping is usually done about March 1. It is time to tap when days of spring are marked by sunshiny weather and crisp, frosty nights.

Spiles or drains for the sap can be made by burning a hole through a length of limb.

Take an ordinary bit and auger and bore a hole not less than three-eighths nor more than five-eighths of an inch in diameter to a depth of about four inches. It is usually best to bore on the south side of the tree. If the tree is very old and large two or three holes may be bored with good results, some distance apart.

Metal tubes, called spiles in the sugar country, may be purchased in many hardware stores the same size as the bored hole and one of these should be driven about an inch into the tree.

If you find it impossible to obtain the spile at a store, do as the pioneers used to do. That is, take a straight piece of limb about three-quarters of an inch in diameter and about five or six inches long. Whittle it down on one end so that it can be driven into the hole.

Take a piece of heavy-gauge wire and burn a hole with it, frequently heated, lengthwise through the heart of the piece of wood. Drive this wooden spile into the bored hole until it is tight, set the pail underneath or hang a bucket on a nail driven into the tree close to the spile.

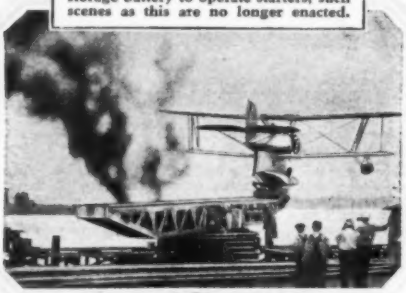
In good sap weather a tree will produce one to three buckets of sap daily.

Once you have the sap, syrup and sugar are made simply by boiling the water out of it. If there is much sap, a shallow pan or evaporator pan should be used in boiling.

U.S. Navy Inventions

Thanks to navy's development of the storage battery to operate starters, such scenes as this are no longer enacted.

Below decks on the U. S. Battleship "Colorado," there are machine shops and scientific laboratories constantly working with practically every problem that confronts civilian industry.



Warfare's oldest weapon, the catapult, and its latest development, the airplane, have been combined by skilled engineers of the United States Navy to launch planes from vessels at sea as a time-saver for ocean commuters and mail delivery.

by

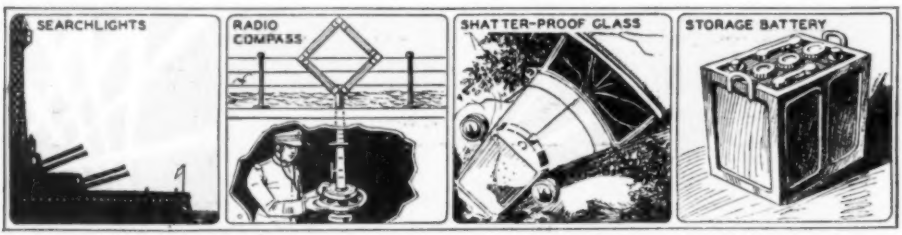
John Edwin Hogg, Lieut., U.S.N.R.

An amazing scientific workshop afloat—that is the peace-time function of Uncle Sam's Navy. The discoveries made by navy engineers and scientists have been responsible for the creation of vast new industries, from which you benefit in many ways, as told here.

TO THE average person, perhaps, the American navy is a tremendous engine of destruction draining the Federal treasury of approximately $350,000,000 every year, and serving no useful purpose to the nation except in time of war.

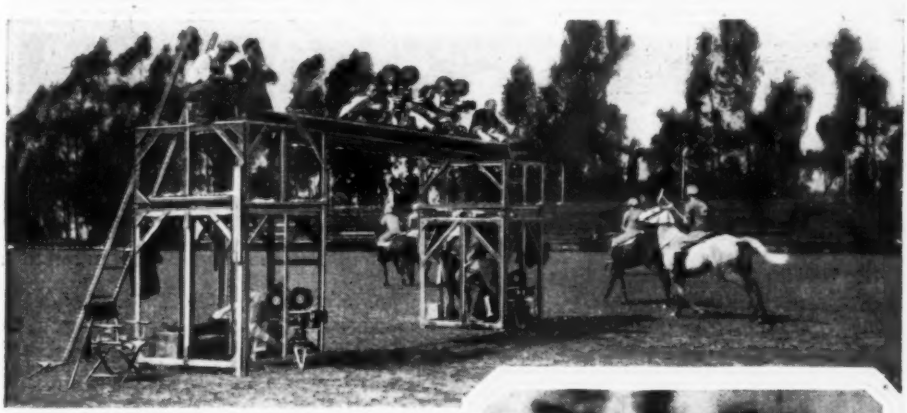
Nothing could be farther from the truth. The American navy in times of peace is a great progressive institution that extends its ramifications into many fields—scientific, mechanical, social, and diplomatic. Its contributions to the progress of industry alone would more than justify its maintenance cost even if its guns were never called upon to fire a hostile shot.

The navy's errands of mercy have saved an infinitely greater number of lives than



These four products, all developed by the navy, have been of vast importance to the world. The radio compass has saved many a merchant vessel from shipwreck. In serious accidents, shatter-proof glass prevents injury to auto occupants.

Build Great Industries



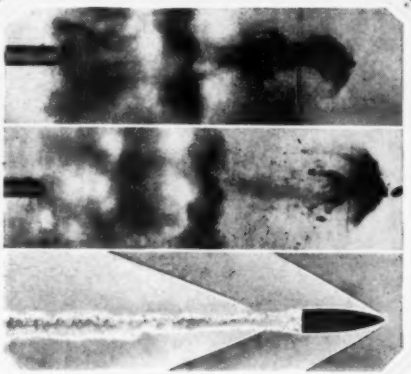
Here high speed motion picture cameras are recording a polo game in slow motion in Hollywood studio. These cameras were originally developed by the United States Navy for recording the motion of gun projectiles in flight.

its guns have ever destroyed. And, without the navy's pioneering in fields of mechanical and scientific research, American industry would have lagged far behind the growth and development it has attained today.

The American navy is probably the world's greatest laboratory of applied science, mechanics, and invention. It is constantly experimenting, fostering mechanical developments, and stimulating research. Important scientific discoveries, inventions, and mechanical developments made originally by the navy for the solution of its own problems have found their way into industry.

Navy Products Advance Civilization

These activities have often been the means of new industries being established, of established industries being greatly expanded, and of providing gainful employments for literally hundreds of thousands of American men and women.

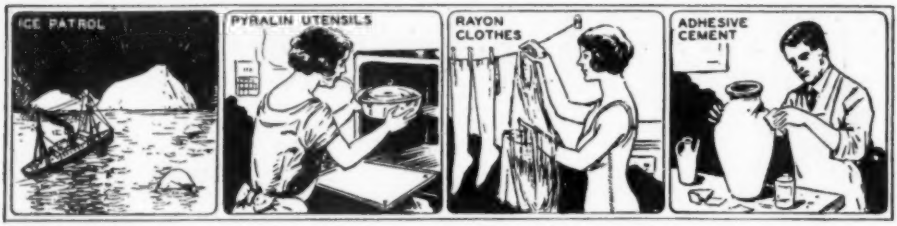


Remarkable high speed photos above of two high velocity shells loaded with No. 6 chilled shot, show effect of inferior wadding. Lower photo shows steel jacket bullet in flight.

Indeed, much of the progress of civilization in which America has gained world leadership has been the direct result of the industrially helpful naval policy originally planned by George Washington.

We live in such a highly developed in-

Careful study of technique of sportsmen and athletes is made possible by slow motion camera. Navy's varnish is widely used in homes. Most all hunters' shells are now filled with smokeless powder. Cellophane brings food to us in sanitary form.



Ice patrol of U. S. Navy keeps shipping lanes clear of ice. Heat-resisting pyralin from which utensils are made, and rayon, which goes into making of clothes, were introduced by naval scientists. Experiments on smokeless powder gave these products.

dustrial age that innumerable important mechanical and scientific developments affecting our everyday lives have been accepted and become commonplace. Yet, many of these things are distinctly contributions of the navy to the industrial fabric of the nation, as well as to the comfort and welfare of the individual citizen.

We go to the theatre, for instance, and are amused and entertained by seeing athletic and other performances projected upon the screen in slow motion. We are not apt to connect this form of entertainment with any activity of the navy. But such a connection does exist. It goes back to 1913 when the navy found the need for a high speed motion picture camera for recording the motion of gun projectiles in flight.

Navy First to Use Slow Motion Camera

No camera capable of making such pictures then existed. So, that year engineers in the naval gun factory at Washington designed such a camera and collaborated with Thomas A. Edison to build three of them.

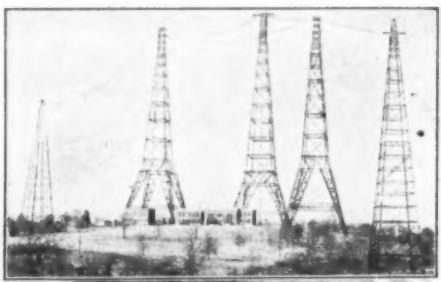
These cameras were motor driven. They were capable of making more than 100 exposures per second, as compared with 15 exposures per second for the fastest camera previously in use. The film actually started and stopped 6,600 times per minute. Yet, they were thoroughly successful for the purpose for which they were designed and built.

The navy used them successfully for several years, and in due time such cameras became obtainable commercially to gain the well-recognized place they now have in entertainment and educational fields.

How Cranking of Autos Was Eliminated

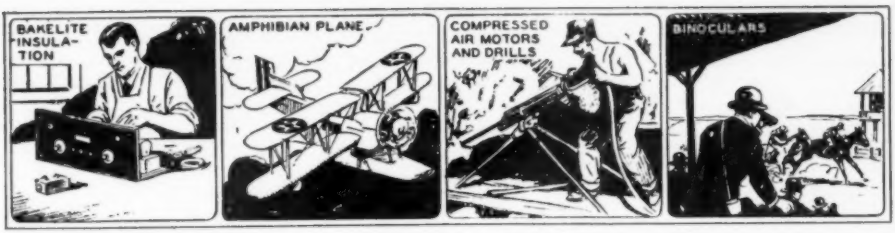
We step into our automobiles, press a button, and the motor starts. Here we must thank the navy for the development of the storage battery that has made possible electric starters and electric lights for our motor vehicles.

People all over the country were breaking their arms cranking automobiles, and



Above—Naval radio station at Arlington, Va. Navy, first to realize potentialities of radio, was largely responsible for present broadcasting.

The electrically-driven passenger liner "Pennsylvania," one of the fastest, most vibrationless, most economical ships afloat. The development of electric propelling machinery by the navy made possible the construction of these vessels.



Bakelite, insulating material, is an indirect product of the navy. Necessity compelled navy aeronautical engineers to devise the amphibian plane. Compressed air motors, drills, cutters came from the invention of the high-explosive torpedo.

motor car manufacturers were experimenting with all sorts of spring contraptions for starting automobile engines while navy electrical engineers labored to develop a dependable storage battery as an underwater power unit for submarines.

After the navy developed the storage battery the automotive industry found one of its most perplexing problems practically solved. Electric starters and electric lights soon became standard equipment on all good cars. Without such electrical equipment the automobile industry would not be what it is today.

Naval Chemists Develop Smokeless Powder

Prior to 1890 black powder was one of the curses of life in the navy. So, in 1891 naval chemists began working in collaboration with the Du Pont Company in an effort to develop an ordnance powder that wouldn't fog up the whole ocean and make navy ships look as if they'd been dug out of a mine disaster after each bit of target practice.

Nitrocellulose seemed to be the most likely substance from which smokeless powder might be developed, and after endless laboratory experimentation it was made to yield a smokeless powder that was far superior to the old saltpeter powders formerly in use.

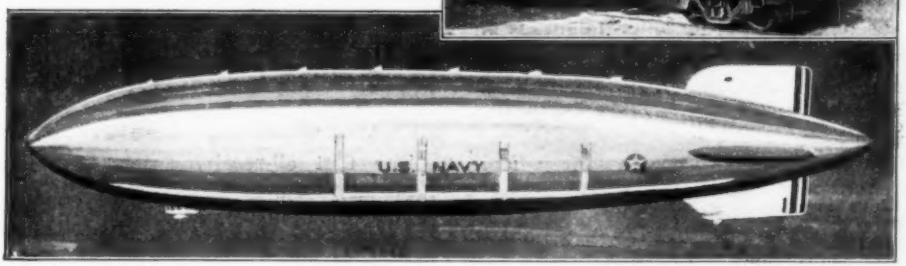
Many Products From Powder Experiments

Now several hundred thousand sportsmen will testify how smokeless powder has contributed to their pleasure. But smokeless powder was only the small acorn from which a figurative oak forest of industry has grown.

In developing such powder for the navy the various chemical solvents of nitrocellulose were discovered, and out of those discoveries have come all the pyroxalin products—pyralin, artificial leather, various floor coverings, adhesive cements, paints, varnishes, lacquers, improved motion picture film, new photographic emulsion carriers, numerous dyes, nonshatterable glass, bakelite, rayon silk (made from cotton), and all the cellophane wrappings in which so many of our food products now come to us in sanitary form.

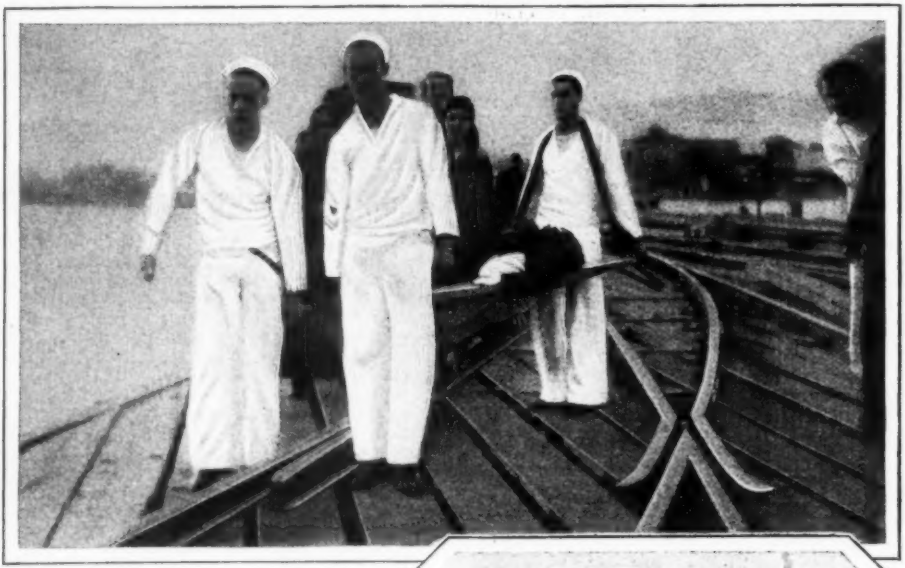
The industries that were created out of the navy's desire for smokeless powder now rank among the nation's greatest—contributing employment, wages, and busi-

Thanks to the development of helium by the navy, airships are now far less vulnerable in war time and far safer for aerial transportation.



The world's greatest airship, the U. S. S. "Akron." The military usefulness of such aircraft justifies the navy in carrying on its great campaign of experimentation with airships. Top center—A specially built tank used for transporting helium.

Navy Stands Ever Ready to Rush Food, Medical Aid to Disaster Victims



Navy's errands of mercy have saved more lives than its guns have destroyed. In the photograph above, American sailors are shown caring for the sick and injured in Smyrna earthquake disaster.

The invention of the Momsen Lung has removed most of the horror from marine accidents, particularly on submarines. In photo above diver is coming up from sub air lock.

Navy's pioneering in the use of compressed air in submarines gave the world compressed air hammers, drills, cutting machines, motors, etc. Also, most of the powerful dock and wharf machinery now used in commercial shipping has been developed by Uncle Sam's navy.

ness profits to literally hundreds of thousands of people.

In our own homes we turn on the radio and listen to a speech or entertainment program from a broadcasting station hundreds, or even thousands of miles away. We have accepted the radio, and we now find one in nearly every American home.

Yet, back of the radio in our living room is the story of how the navy is directly responsible for its development, as well as for the tremendous industry that radio represents to us today.

When Marconi discovered the principle of the so-called "wireless telegraph" the American navy was the first sea-going organization to recognize its possibilities for a new era of communication at sea. At that time not an ounce of "wireless telegraph" equipment was being manufactured in America.

Navy Responsible for Growth of Radio

The first all-receiving sets were designed by naval engineers and built for the navy. Public demand and quantity production brought the prices down. The boon that radio now is to the entire nation, as well as the vast industry into which radio has developed, is largely a

(Continued on page 178)

New Sport Binoculars Worn Over Eyes Like Spectacles

ANNOUNCERS at football and baseball games have long been in need of some instrument to give them a closer view of the playing field, and manufacturers have come to their rescue with a pair of binoculars which are adjusted to the eyes like ordinary spectacles.

A special head band keeps them in place during the game, as illustrated in the accompanying photo. When the observer wishes to rest his eyes for a moment and get back to normal vision, the glasses can be raised and rested on the forehead.

When watching football or baseball game the radio announcer wears new binoculars like spectacles, supported by head band as shown. Glasses are raised when out of use.

Auto Fuel Used as Refrigerant

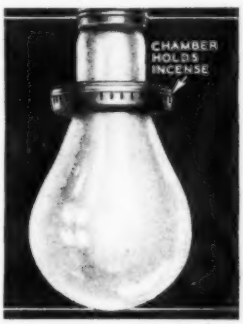
A RECENTLY developed automobile fuel oil, called Petro-gas, can be made to serve as a refrigerant in the truck or bus being driven by it, thanks to a new cooling system developed recently by engineers.

This new fuel is held under pressure in the auto's tanks, and before being run into the carburetor is circulated through expansion coils in the body of the car, as shown in diagram below. The fuel evaporates as it flows through the coils, absorbing heat, the heat coming from the interior of the body thus accomplishing the refrigeration.

The gasified oil is then led through regulators to the carburetor, to be consumed by the engine. Any moderate temperature below zero can be attained. The refrigerating system has not yet become practical for private autos. When this is achieved it will be possible to install inexpensive cooling systems in the bodies of pleasure cars.

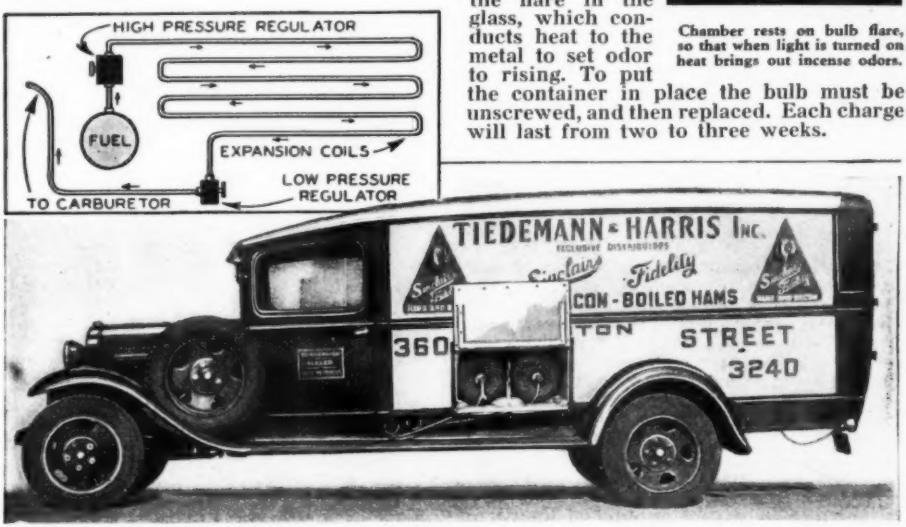
Incense Burner Fits on Light

AN INCENSE burner recently introduced, which fits on a light bulb as illustrated in the accompanying photo, starts the incense to smoking the minute the light is turned on.



Chamber rests on bulb flare, so that when light is turned on heat brings out incense odors.

The ring which holds the small pebbles rests on the flare in the glass, which conducts heat to the metal to set odor to rising. To put the container in place the bulb must be unscrewed, and then replaced. Each charge will last from two to three weeks.



In this new refrigerating system, fuel from tank, located above running board as shown, passes through regulator, thence to expansion coils which absorb the heat from the body of the auto, cooling it to preserve meats, vegetables, etc.

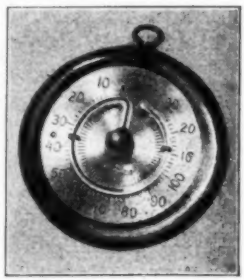
New Keyholder Has a Flashlight to Find Lock at Night

Small flashlight is contained in end of this new key holder. Pressure on button on bottom lights bulb, which shoots beam of light to illuminate keyhole in small hours of night.

A FLASHLIGHT is often, especially in the small hours of the night, a necessary adjunct of a key, so with this in mind manufacturers have set about filling the need. Their product is a combination flashlight and key holder, shown in the photo at the left. The light, built into the end of the holder, throws a circle of light on the lock, and is turned on by a button at the bottom. The holder clasps together compactly, easily carried in the pocket.

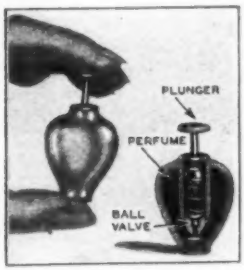
Luminous Circular Thermometer

COMPACTNESS is the feature of a new thermometer, which has the mercury tube wound in circular shape instead of straight as in ordinary thermometers. Both the mercury and the numbers on the scale are numbered a dark blue, so that reading the temperature is easy in the dark.



Mercury in tube is colored blue for visibility at night.

Perfume Spray Prevents Spilling



Pressure on finger on plunger shoots small spray of perfume, without danger of leakage.

PERFUME cannot be spilled from a new tiny leak-proof atomizer now being marketed. The perfume is sprayed through a valve in the side of the container by pressing down on the plunger with the forefinger. The ball valve eliminates all chance of leakage of liquid from container.

Egypt Thought Sky Was Iron Roof

ACCORDING to the ancient Egyptian idea of the universe, as pieced together by modern scholars from fragments of Egyptian documents, the earth was supposed to be a reasonably flat plain bounded on the north by high mountains beyond which was darkness and the narrow stream of the River Ocean, flowing through eternal night.

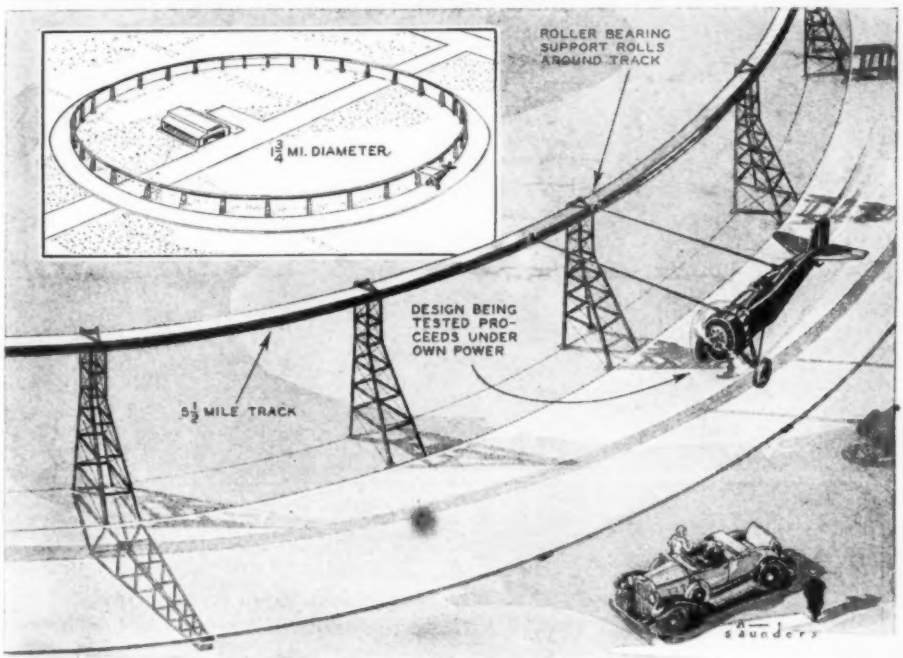
On the other sides of the earthly plain this river was believed to flow through opener and lighter country. The sky, Egyptian priest-astronomers thought to be a gigantic iron roof supported above the earth on four iron pillars imagined to rest on tall mountains to the north, south, east and west.

Fireplace Moves to Out of Doors

WARMTH, combined with an abundance of fresh air, is provided by an outside fireplace recently built by a Kentuckian, who is apparently an outdoors enthusiast. The opening which holds the grate is topped by a stone ledge, which is ornamented by two old-fashioned wall lamps.

An ideal fireplace for the fresh air enthusiast. Built against side of house, it is suitable for outdoor parties.

Airplanes Tested Without Leaving Ground


ROLLER BEARING SUPPORT ROLLS AROUND TRACK
1¾ MI. DIAMETER
DESIGN BEING TESTED PROCEEDS UNDER OWN POWER
5½ MILE TRACK
Saunders

The "Accelerdrome," a circular monorail elevated track 5½ miles in circumference, on which airplanes may be given actual flight tests in comparative safety. The projected design is the work of M. Louis Bleriot and M. Esnault-Pelterie.

A NEW method of testing the power plant, streamlining, and other features of design under actual flight conditions, without the danger which is ever present when a new racing design first leaves the ground, has been proposed by M. Louis Bleriot, the French airplane designer and manufacturer who was the first man to fly across the English Channel.

The projected testing plant, to be known as an "Accelerdrome," will consist of a circular elevated monorail track five and one-half miles in circumference. The track will be supported by steel towers and will be surrounded by a concrete runway, or landing apron.

The airplane design to be tested, complete except for the wings, will be wheeled out to the apron and hooked onto two steel rods which are suspended from the monorail track by lubricated and ball-bearing casters. The plane will then proceed down the runway under its own power, centrifugal force causing it to leave the ground as soon as sufficient speed has been obtained.

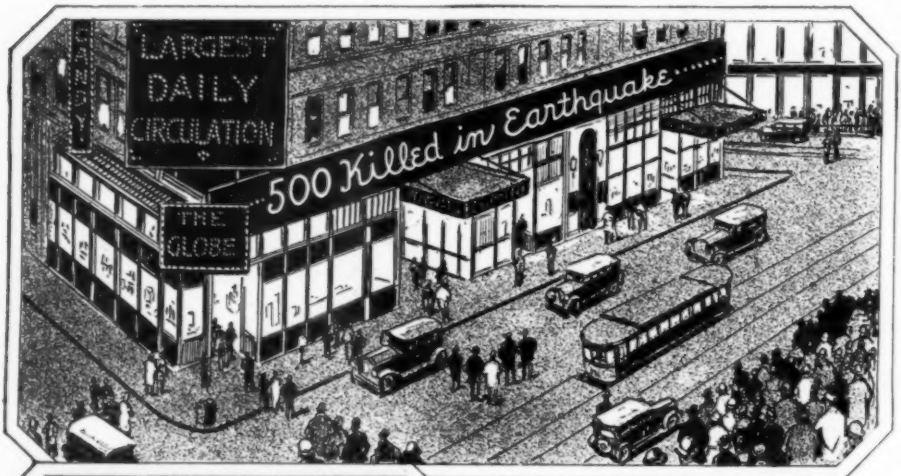
This method of testing will permit the trial and perfection of engines, propellers, cooling devices, motor mounting, streamlining, and other problems.

Atlanta Boy Builds Midget Auto

ALTON COBB, an Atlanta schoolboy, found an old washing machine motor lying about the house, and decided that it should be put to some good use. He converted it into an automobile engine and now has the contraption you see below.

Alton Cobb, of Atlanta, Ga., going for a spin in his gasoline "Chugmobile." The design, while extremely simple, shows considerable ingenuity. Note the gas-pipe brake.

FORTUNE Making Ideas



Neon tubes have greater visibility than ordinary light bulbs and would thus be ideal for the signs which flash news items in sign form, as illustrated above. The problem awaits a solution by some inventor, who will profit greatly by the answer.

Simple inventions frequently yield biggest rewards, but you've got to keep a keen eye peeled to see just what the world needs most. If you fill these needs you'll profit immensely. In this article Mr. Yates sets forth a number of ideas, for which, if developed, manufacturers will gladly pay sizeable fortunes.

ONCE again I maintain that it is the simple things that make the money. I could go on and make a list of thousands of small items that have made fortunes for their clever inventors.

The world needs so many improved things, many of them disgustingly simple, that it is a shame that more men do not take up inventing as a profession—something which, by the way, Edison believed in thoroughly and a subject I discussed with him at length during a visit to his laboratory some years ago.

1. Neon Signs for News Flashes

We have all seen the electric signs used to flash news events high above the sidewalks of Broadway, New York, and the main streets of other large cities.

We know that Neon signs have a greater visibility than any other form of light known. They would be beautifully suited for the purpose mentioned if some keen inventor would show how it could be done.

Tone quality of dynamic loud speakers is seriously affected by temperature changes. A new cone material is needed.

The cry goes up from women fond of swimming: Save our permanent waves, you inventors. The lucky inventor who devises a leak-proof bathing cap will stand a good chance to reap cool millions in royalties. So get busy.

For INVENTORS

by Raymond F. Yates

There must be and is some way of doing this and I am sure that some ingenious fellow with a long head will be able to dope it out. Don't ask me how it can be done—I'm asking you. I really don't see why special neon bulbs cannot be used with especially designed motor-driven contacts suited to the high voltages under which neon signs operate.

Specifications: The neon sign device may cost more—say roughly twenty-five per cent more—than a standard outfit operating with ordinary incandescent lamps because it will do more. It should be thoroughly reliable and operate either from a device like a typewriter or a piece of perforated tape.

Exploitation: Should be patented in this country and sold outright to some large manufacturer of electric signs. Royalty in this case would be out of the question for the signs would be so expensive that but a few of them would be used in the larger cities.

Offhand, I should say that $20,000 would be a fair price to ask for a thing of this kind.

2. *A Weather-Proof Radio Speaker*

Both the materials of which the cones of dynamic radio speakers are made and the material that is used to hold them are affected by both changes in temperature and by atmospheric conditions of moisture. Either a new and better principle of operation is needed or a new and better method of assembly—take your choice.

(Continued on page 190)

Moths often wreak havoc on the felt used in pianos, necessitating expensive repairs. Moth-proof material is required.

Department store owners say they need a new type of collapsible cardboard box with which to wrap small articles.

Every amateur cameraman would like to be able to take panoramic pictures with an ordinary kodak. What is in demand here is an ordinary attachment that could be applied, so that everything within 180 degrees could be photographed. When sending in your questions on this or any other fortune making idea, do not accompany your letter with a model of your invention. A drawing and description is all that is required. Editors cannot be responsible for models sent in for comment.

TEST YOURSELF *for a*

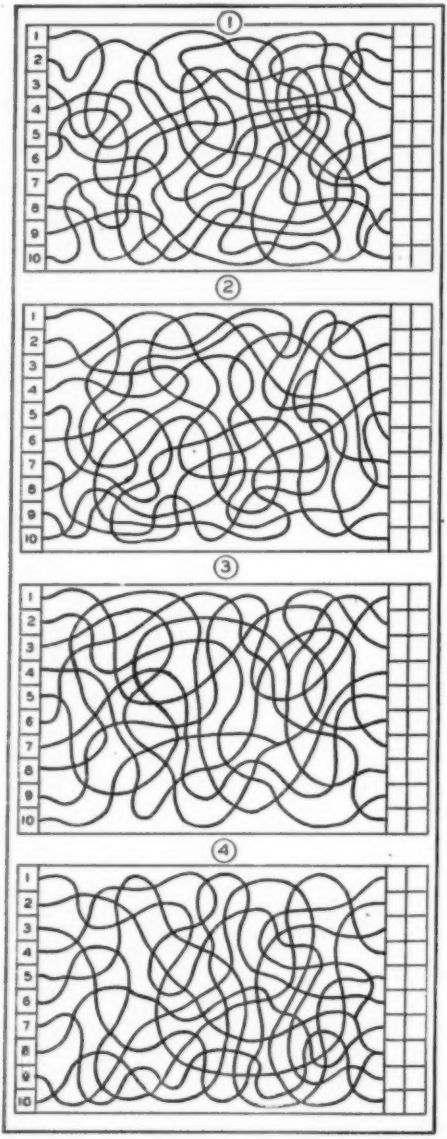
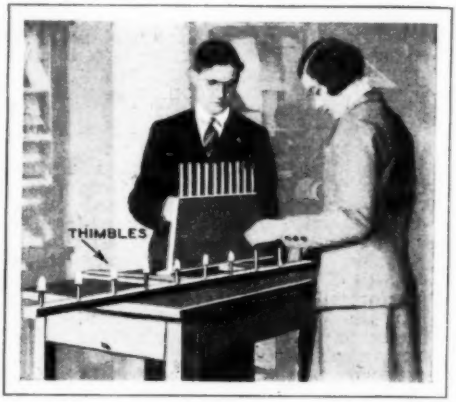


Fig. 1. The pursuit test, based on "MacQuarrie Test for Mechanical Ability." The object here is to follow each line with the eyes, beginning in the numbered square at the left, through the maze of other lines to its "home" square on the right. When you have traced the line to its terminus mark in the square the number of the square at which the line began. If two lines unite and end in one square, mark number in the square alongside. Time allowed for this test, two and one-half minutes.



In the photo above an applicant for embroideress's job is undergoing aptitude test to determine speed of long arm movements. The rubber thimbles must be transferred as rapidly as possible from one row of pegs to the other.

by

RUSSELL J. MORT

Even though you may not be engaged in some mechanical trade, you might be agreeably surprised to learn that you are gifted with much inborn mechanical ability, which so far you have never put to use. These simple scientific tests, devised by psychologists, will quickly and accurately reveal to you the extent of your aptitude for mechanics and indicate the success you might achieve in some technical vocation.

WOULD you like to know how much latent mechanical ability you have?

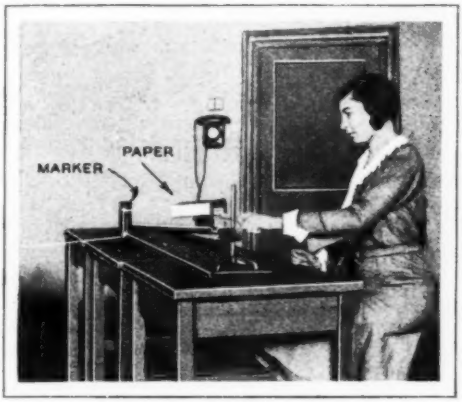
Psychologists, after exhaustive research, have now made it possible and easy for you to be examined to determine with striking accuracy what are your hidden capacities for success in some mechanical line of work.

Believing that mechanical aptitude in any person will eventually out, these psychologists have devised sets of remarkably simple tests that will measure your ability to reason out both simple and complex mechanical problems and the quantity of scientific information you have subconsciously absorbed from experiences of your daily life.

If you are anxious to know the extent of your innate mechanical ability, don't hesi-

Mechanical JOB

SIMPLE TESTS ANALYZE YOUR ABILITIES



Prospective women chauffeurs are subject to test demonstrated here. Paper card, which has line through center, must be released so that it strikes marker at correct point.

Warning

With these tests you can be examined for latent mechanical ability, but it is necessary that some friend act as a monitor for you. To get most accurate results, it is advisable that you immediately turn this article over to him, so that he can read instructions and set about giving you the problems. Do not solve the problems in advance, else the results of the tests will be inconclusive.

tate to be examined because you have had little or no education in science or experience in shop work or in any trade where mechanical ability is involved.

What counts in these tests are your *interests*. Though you may be engaged in some other line of work, like bookkeeping or selling, your real interests may be in automobile motors, radio, woodworking or one of a hundred other mechanical avocations, so that you are playing the age-old role of the "round peg in the square hole." If such is the case, these tests may prove a startling revelation to you.

How Mechanical Interests Are Revealed

There are subconscious tendencies which you might have formed that are sure signs you possess mechanical aptitude. If, for instance, you walk along the street and stop to watch a steam shovel at work, then without deliberate effort begin to puzzle over the operations of the mechanism of the shovel—that, say the psychologists, is unmistakable evidence that you have some degree of inborn aptitude for mechanics.

What information and reasoning ability you have acquired from such experiences as the aforementioned will be brought out in these simple tests. If you make a high score you may be fairly certain that you would rise rapidly in some line of mechanical work, if you are not already so engaged.

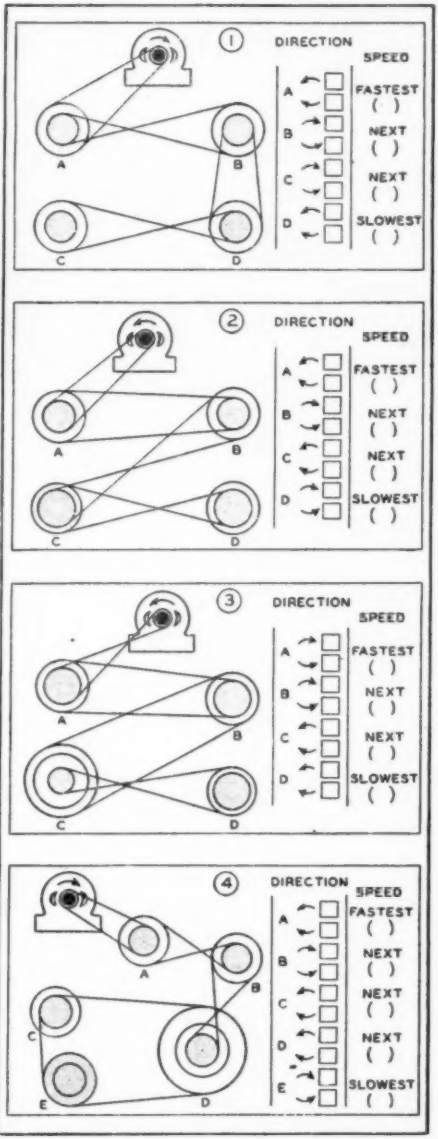


Fig. 2. The pulley problem, based on the "Detroit Mechanical Aptitudes Examination for Boys." In this test the subject is to figure out the speed of each pulley and the direction in which it revolves. Direction in which the motor revolves is given with an arrow. Mark direction with an X in squares lettered A to D or E in each problem. For instance, if pulley A in problem 1 turns to left make X in top square; if to right, put X in lower square. In the parentheses, put letter of fastest pulley first, then next in speed, and so on to the slowest. Time allowed, 3½ min.

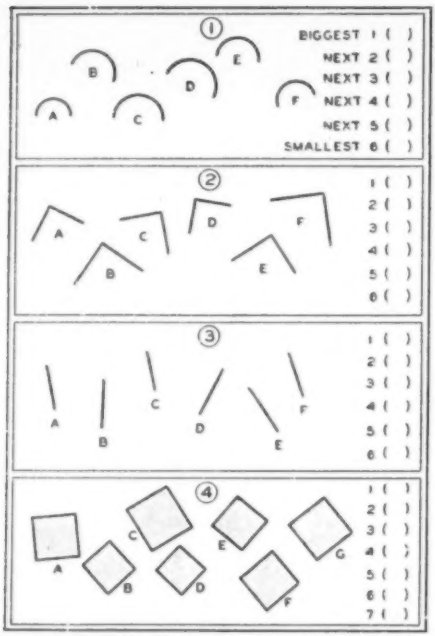


Fig. 3. The comparative size test, from "Detroit Mechanical Aptitudes Examinations." Beginning with problem 1, mark in the parentheses numbered 1 the letter of the largest semi-circle. Then mark next in size, and so on to the smallest. Do likewise with the angles, the straight lines, and the squares. The time allowed for this test is one minute, and object is to test your judgment in matter of comparative sizes.

Can You Judge Size Accurately?

Extensive investigation has gone into the preparation of these tests. Bearing in mind the estimates made by statisticians that 40 per cent of the people of the United States are earning their livelihoods in vocations where mechanical ability is required, psychologists have worked out numerous schemes for determining the fitness of workers for their jobs, for testing new applicants, and for measuring the latent capacities of students aspiring to enter mechanical trades.

The examinations which you are about to take are based upon two sets of tests designed especially for youth and widely used throughout the nation in vocational guidance work: "The Detroit Mechanical Aptitudes Examination for Boys" and "The MacQuarrie Test for Mechanical Ability."

Tests Based on Investigations of Experts

While a large degree of comprehensiveness is sought in these tests, it is to be understood that only a portion of the MacQuarrie and Detroit examinations are presented. These tests, in their original form, cover a wide scope of problems, but the most outstanding and important ones are set forth here. Further data on these tests are available from MODERN MECHANICS AND INVENTIONS editors.

Taking the examination is surprisingly simple. In fact, practically all the equipment you need is a sharp lead pencil, a watch (stop watch preferred), and some friend to act as a monitor.

Of course you should not cheat—that

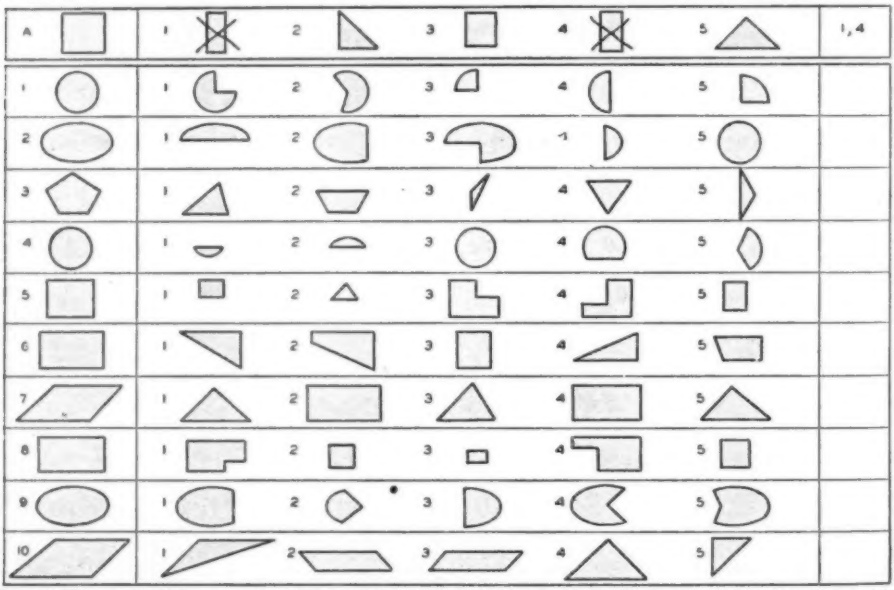


Figure 4. The completed figure test, from "Detroit Mechanical Aptitudes Examination." Tests are worked as illustrated in Example A, at the top. Mark the pieces from 1 to 5 in each line, which, when assembled, form the completed figure shown in the column at the left. Only two pieces are to be marked in each line, and no more than two. Time, 2½ min.

goes without saying, for then the test cannot give you an accurate measure of your mechanical aptitudes. The first way to avoid cheating is not to attempt to work out any of the problems in advance, so that you won't already know the answers.

Instructions for Taking Tests

The first step in taking the tests will be to get a thorough understanding of correct procedure. To obviate any possibility of cheating, and thus get the full benefit of the tests, it is advisable at this point to turn over this article to the friend who is to assist you, so that he can get an understanding of the correct procedure and then set about giving you the problems.

The time for each test is limited to the number of seconds specified. Timing is best done with a stop watch. All answers are to be found at the end of the article.

Eight separate tests constitute the examination. Before giving each test, the monitor should explain thoroughly to the subject just what he is to do, making the procedure completely clear before beginning.

No. 1. The Pursuit Test

This test is shown in Fig. 1. The object here is to follow each line, beginning at the numbered square on the left, through the maze of other lines to its "home" square on the right. The eyes only are to be used —no pencils allowed, except for marking. When you have traced the line to its terminus, mark its number in the vacant square.

In case two lines unite in the course of

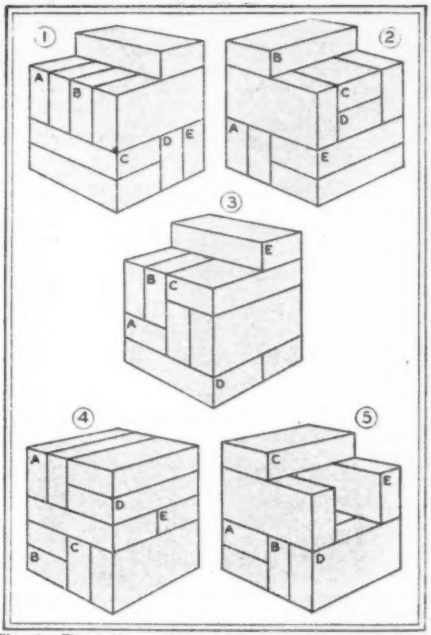


Fig. 5. The adjacent block test. Here the subject must judge the number of blocks touching blocks A, B, C, D, and E in each group, marking beneath each letter the correct number. Each block must be counted no matter how little of the surfaces touch. Notice that sides touch bottoms, ends, tops, etc. Based on "MacQuarrie Test for Mechanical Ability." Time allowed, two minutes, ten seconds.

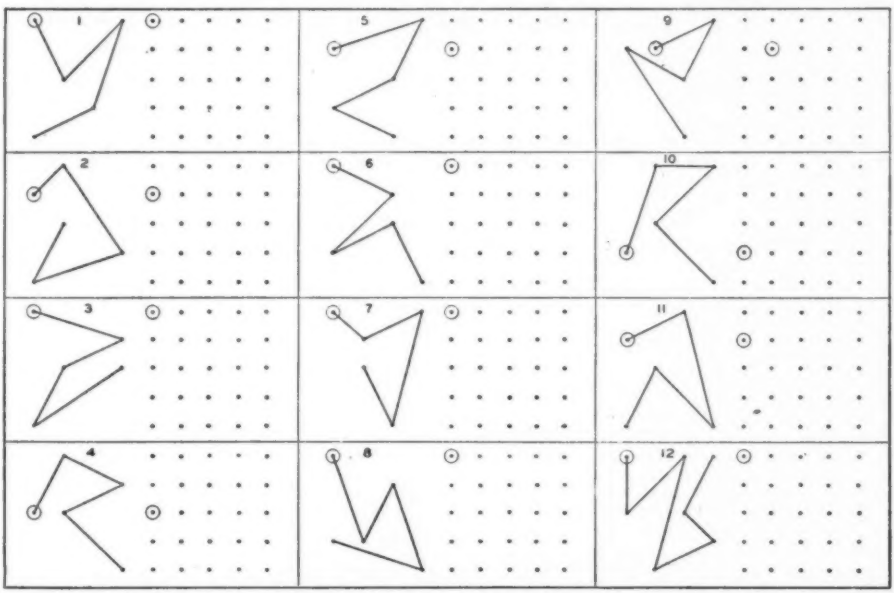


Fig. 6. The copying test, taken from "MacQuarrie Test for Mechanical Ability." In each rectangle is found a square of dots, one of which is encircled. On this point the subject should place point of his pencil, and proceeding thence, via the dots, reproduce, as closely as possible, the lines at the left in the rectangle. Time allowed, one minute and fifty seconds.

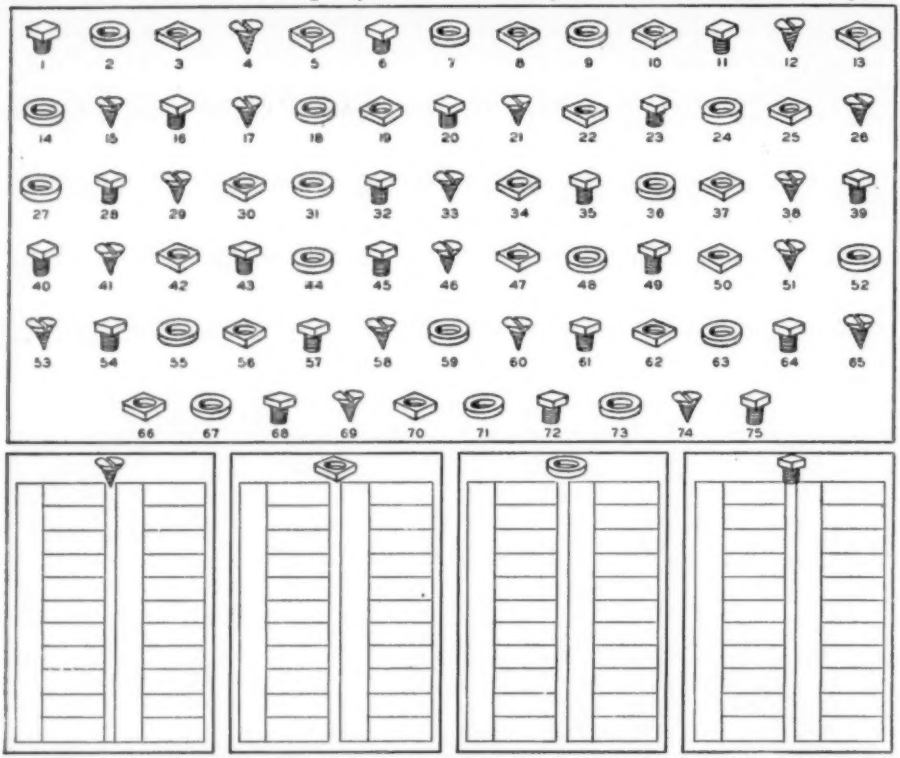


Fig. 7. The sorting test, based on "Detroit Mechanical Aptitudes Examination for Boys." In this test, the nuts, bolts, washers and screws at the top are to be sorted out. The first box at the bottom will get the screws; the second box, the nuts; the third box, the washers; the fourth box, the bolts. Place the number of the article in their proper boxes, beginning with bolt marked 1 and ending with article 75, a bolt. Two minutes are to be allowed for completion of the job.

their wanderings and end up in one square, mark the number in the additional square alongside. The time allowed is two and one half minutes. Correct answers and methods of scoring for all tests are given at the end of this article.

No. 2. The Pulley Problem

In this test the subject should figure out the speeds of each pulley and the direction in which it turns. Direction in which the motor pulley revolves is given by an arrow, all motion beginning at this point. At the right in each problem is a column of squares in which the direction in which the pulley revolves is to be marked. For instance if pulley A in problem 1 revolves to left mark an X in top square. If to right, put an X in lower square. In the parentheses, mark the letter of the fastest pulley first, then the next in speed, and so on down to the slowest. Time allowed for this test is three and one-half minutes.

No. 3. The Comparative Size Test

The purpose of this test (Fig. 3) is to see if you can determine comparative sizes with only your eyesight to rely on for judgment. Beginning with problem 1, mark in the parenthesis numbered 1 the letter of the largest semi-circle. Continue on down through the list, marking the next in size, and so on to the smallest.

Do likewise with the angles, the straight lines and the squares. Time for this test, one minute.

No. 4. The Completed Figure Test

The manner in which this test is worked is illustrated in example A, at the top of Fig. 4. The two pieces which, when assembled, form the completed figure shown in the column on the left, are to be marked with crosses, like pieces 1 and 4 in the aforementioned example. In this way, mark all the necessary pieces from 1 to 5 in each line, remembering that there are two in each line to be marked, and no more than two. You get one and one-half minutes to complete this test.

No. 5. The Adjacent Block Test

The successful working out of this test, shown in Fig. 5, requires, above all, rapid judgment. Here the subject taking the test must judge the number of blocks touching the blocks lettered A, B, C, D and E in each

group, and mark beneath each letter the correct number.

To determine the correct number you will first have to examine the group carefully to see just how all the blocks are arranged. It will be noted that they are laid down so that ends touch tops, sides touch bottoms, etc.

Each block must be counted, no matter how little of the surface is touched. Time allowed, two minutes and ten seconds.

No. 6. The Copying Test

Good eyesight and an ability to reproduce what you see is the chief requisite in this test, which is found in Fig. 6. In each of the rectangles, numbered from 1 to 12, are found a square of dots, one of which is encircled.

At this point the subject is to place the point of his pencil, proceeding thence via the dots by straight lines, reproducing, as closely as possible, the lines in the figure at the left in each rectangle.

Each straight line must begin and end on a dot. No ruler is to be used, but it won't count against you if your lines are a little wobbly. The chief point is that the lines be of correct length and that the correct dots be touched in the process of copying.

No. 7. The Sorting Test

In this test, the nuts, bolts, washers, and screws shown in the upper half of Fig. 7 are to be sorted out. The first box at the bottom will get the screws; the second, the nuts; the third, the washers; and the fourth, the bolts.

Begin with the bolt marked 1 and proceed across the page, straight on through to the final article, a bolt, numbered 75. Place the numbers of the articles in their proper boxes. Thus, in listing the first article, a bolt, you will mark a 1 under the box headed with a bolt; a 2 under the washer; and so on throughout the test.

Mark the numbers in the spaces beginning at the top and proceeding to the bottom, then go to the next column. Two minutes are allowed to work out this test.

No. 8. The Dotting Test

The Dotting test (Fig. 8) is perhaps the easiest on the list, but you've got to have a steady hand and a sharp eye to get a good grade. The subject should put a good point on his pencil, hold it up till his monitor says "go," and then, starting at the first circle on the list, put a dot in each circle, speeding along the course as rapidly as possible.

Direct your efforts to covering as much ground as possible and to getting the dots in the circles. If the dots fall on the edge, that's in your favor, but should they come outside, then you get no credit for your effort. For completion of the test, 25 seconds are to be allowed.

Answers for Scoring

The monitor who conducts the testing should do the scoring. Each test is graded on a hundred point basis, and when the score for each test is determined the grades for the entire eight tests are added, then divided by 8 to get the average, or final score.

(Continued on page 182)

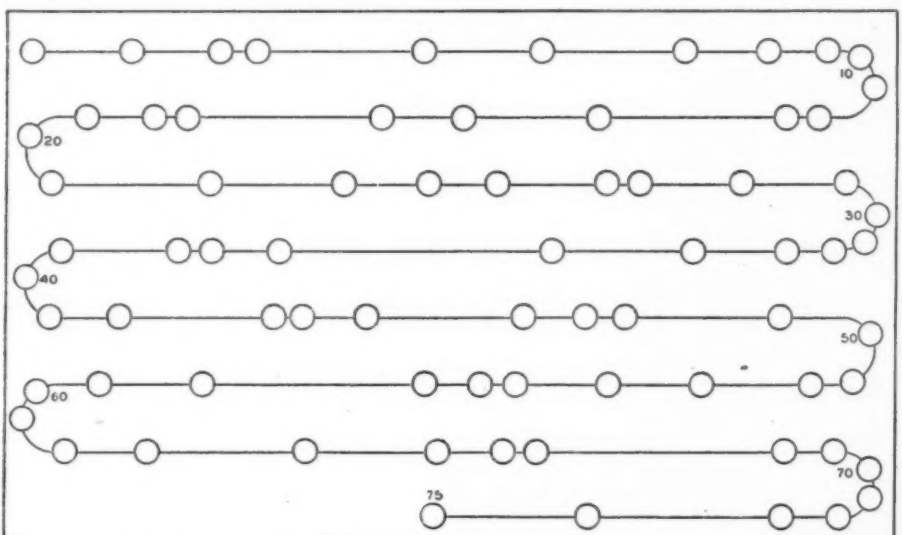
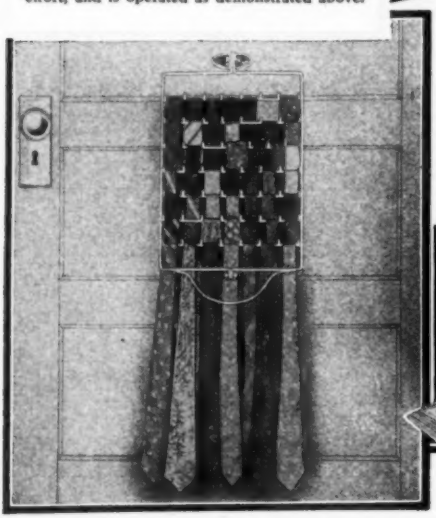


Fig. 8. The dotting test, based on "MacQuarrie Test for Mechanical Ability." Starting at the first circle in the series, the subject should put a dot in each circle, speeding along the course as rapidly as possible. Make an effort to get the dots clearly inside the ring, for outside they don't count. Time allowed, twenty-five seconds.

Inventions Take Drudgery

Using the new orange juicer shown above, only a few twirls of the handle are necessary to remove all liquid from fruit. When the job is done the cup is removed and the juice poured into the glass, ready for drinking. The mechanism may be cleaned with very little effort, and is operated as demonstrated above.

Operated by hand, the malted milk mixer shown above works at a much greater speed than the standard mixers employed at soda fountains. Lumps of ice cream and powdered malted milk are whirled into a tasty drink in 15 seconds. The mechanism is geared 42 to 1, giving a speed of approximately 8000 revolutions per minute.

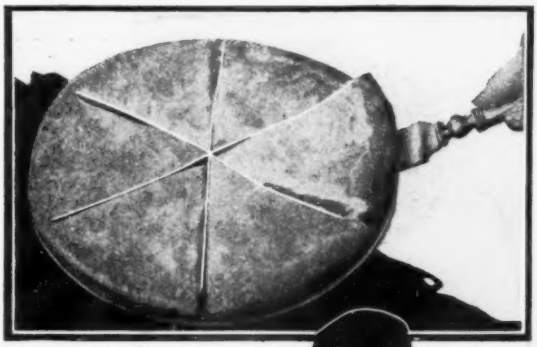


With this new tie rack, any tie may be removed with utmost convenience, leaving others undisturbed. The rack lies flat against the door and is lifted with handle.

Wax paper sandwich bags are now used to hold odds and ends of food for safe keeping in electric refrigerators. Small pieces of cheese, fruit, meat, etc., are easily slipped in bags to be kept sanitary and to prevent drying out.

from Household Tasks

Scientifically brewed coffee is the product of the new "Vaculator" brewer shown above. Heat drives water to top, which holds coffee, and when heat is removed liquid filters down into lower glass again from which it is served. Metallic taste is eliminated by use of glass.

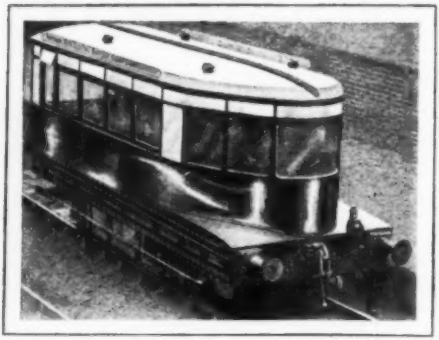


Special composition paper insert, recently introduced, makes possible baking of pies in individual portions within one pan. Used sector is discarded.

Simple cake tester shown here consists of wire with loop handle, and hook for hanging. Wire is inserted into cake and withdrawn. If it comes out clean the cake is done. A schedule of baking time accompanies tester.

A door that opens either left or right is the feature of new refrigerator now on the market. Such an arrangement eliminates the necessity to shift dishes in hands and saves time. Drawing above shows how the hinge works.

Electric Car Driven by New Type High Voltage Battery



New Irish electrically driven train employs special alkaline batteries with high voltage cells chargeable in few minutes.

MARKING a milestone in the history of railroads, a train propelled by a new type of electric battery has recently been put in service in Ireland, which eliminates the necessity of trolleys and third rails.

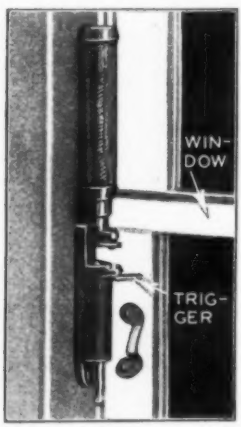
This new battery, which is the heart of the power system, is described by the inventor, Dr. James Drumm, a young Irish scientist, as a "low resistance alkaline battery of robust construction," with a voltage higher than that of any existing alkaline battery.

What makes this new battery particularly serviceable for railway transportation purposes is the fact that it can be recharged in a few minutes, so that no lay-up of the car is necessary when it is to be "re-juiced."

Cocoanut Oil Runs Diesel Motor

SCIENTISTS have now demonstrated the possibility of using cocoanut oil in Diesel motors. The experimenters have found that the oil produces no corrosive acids in the cylinders and that no corrosive effects have been observed during combustion. Power loss was found to be low.

Tom Carr's Explosive Thief Alarm



Cartridge is exploded when prong on frame strikes trigger.

IF you've been reading the funny papers you've heard of Tom Carr's burglar alarm. Now this alarm is actually on the market. Shown at the left, the alarm consists of an attachment for the side of a window which explodes a blank cartridge when a burglar attempts to jimmy the door or window. A prong on the frame strikes a trigger, causing an explosion and giving the thief the surprise of his life.

Chemists Make Soap From Suds

SHORTAGE of fats in Russia has induced Moscow chemists, it is reported, to devise ways to collect the used soapsuds and rinse water from laundries, dish-washing departments of restaurants and other places where much soap is used and to recover the soap chemically so that it can be used over and over again.

U-Shaped Candles Burn Both Ends

Especially decorative for dining tables are those new U-shaped candles available in any color to suit decorations. Holders, U-shaped also, are finished in chromium and black, forming attractive ornaments.

BURNING the candle at both ends is quite the socially correct procedure with a new U-shaped candle which is now being marketed. These candles come in a variety of colors to suit the individual tastes or to match table decorations.

Also available for use with these candles is a special candle holder finished in chromium and black and designed in U-shape.

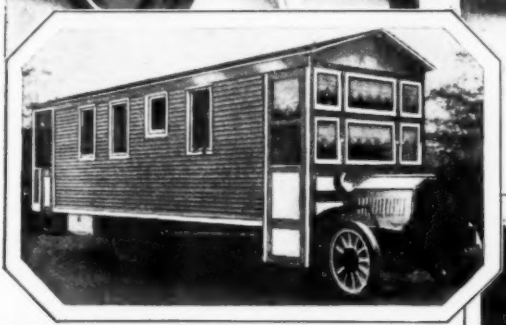
Tee Pin for Women Golfers

AWARE that women get frenzied over golf, too, manufacturers are now marketing a special tee-pin for members of the weaker sex. Worn in the sweater, the pin holds five indestructible tees made of bone, and has a safety catch to prevent loss.

Worn in sweater, this pin holds five indestructible golf tees.

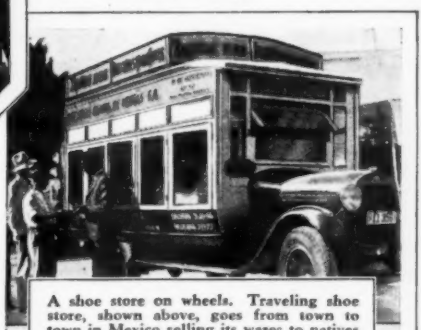
PUTTING BUSINESS *on* WHEELS

A bank on wheels. This traveling bank teller and his motorized "branch" of a Los Angeles, Cal., bank serves hundreds of small depositors in outlying sections of the city.



Motorized home above consists of living room, bath room, kitchen and back porch. It has electric refrigerator, and 1,250 watt light plant. Roscoe C. Ward and his wife, of Illinois, take to this home when overcome with wanderlust.

This farm exhibit in Los Angeles, Cal., was devised to educate city children, 25 per cent of whom had never seen a cow. The truck circulated through school districts.



A shoe store on wheels. Traveling shoe store, shown above, goes from town to town in Mexico selling its wares to natives along the way.

Doll hospital on wheels. This innovation in Oakland, Cal., answers urgent calls to repair progeny of "little mothers."

THIS is truly a motorized age, for among the long immovable institutions which have recently taken to wheels are the bank, shoe store, farm exhibit, doll repair shop, and most unusual of all, the home.

Great convenience is afforded by these contrivances which reverse the usual processes and take the market place to the people. A Los Angeles bank has a mobile branch which goes to people in outlying sections of the city to take their deposits.

A shoe store wanders around Mexico selling shoes to the natives.

Simple TRICKS *for* APRIL

Anything in the way of a joke is excusable on April Fool's day, but your tricks have to be original if they are to bring a laugh. The main thing is to take your unsuspecting victim by surprise, and for that these simple stunts sure fill the bill. Not only will they do duty on April first, but they will also liven up any party when things get dull.

The arm of the jokester should be drawn up into the sleeve, so that rubber glove protrudes like real hand. The victim of the joke then yanks off the hand as shown above.

WHAT HO, my lads! 'Tis April First and time for simple, wholesome fun. There's nothing like a good joke party for rejuvenating purposes. You've got more license, if you like to execute practical jokes, on April First than any other time of the year. Let's see what we can suggest.

Everyone likes chocolate coated patties. But a thin skin of chocolate can hide much. Get a nickel's worth of plaster of Paris and add enough water to make a rather thin batter. Set out a pie tin or two and with a teaspoon drop spots of the plaster so they spread out in a good imitation of a peppermint patty. In five minutes they will have set. (See Fig. 6.)

Making Fake Peppermint Candy

In another dish fix up some real chocolate over the stove, adding only enough water and sugar to give a cream-thick liquid. With a pair of tweezers, dip these plaster bits in the chocolate, let them drip a moment, then place them back in the tin.

In an hour they will be ready. These can be mixed with real candy or served in any way you wish. The victim must get through the wholly edible and tasty coating to produce the desired results.

One of the best candy jokes is to get a box of good chocolates and provide a piece of white cardboard just large enough to fit down at the back. This card reads, in lettered fashion as shown in Fig. 8: "Good Candy. Help Yourself."

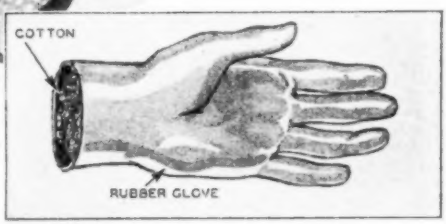


Fig. 1. Rubber glove which plays the part of the false hand is stuffed tightly with cotton to make it appear lifelike.

The set-up is so obvious to many that they will shun the box like poison. Another laugh goes up when some bright person discovers that the candy is no fake.

Unless you have real peanuts beside them for comparison, ordinary raw kidney beans make an excellent imitation. Carefully crack a few peanuts, remove the nuts, touch the edges of the shells sparingly with glue and press the halves together again with kidney beans inside. This stunt can be worked best if one fake is mixed in to the proportion of about 5 good peanuts for each serving. Get large sized beans if possible. Or the bean peanuts can be served by themselves if the crowd isn't large.

Handkerchief Trick Gets the Laugh

Here is a trick that is good in any gathering. Fasten a lady's handkerchief to the floor with a long thumb tack, if possible, close beside a chair used by a lady as illustrated in Fig. 2. She should be tipped off and help in the victimizing of the first gallant male who saunters near.

Often the idea can be used several times during the evening. This can be varied by other articles to suit, such as a glove, scarf or purse.

A trick comb can be simply made

FOOL JOKESTERS

by DALE VAN HORN

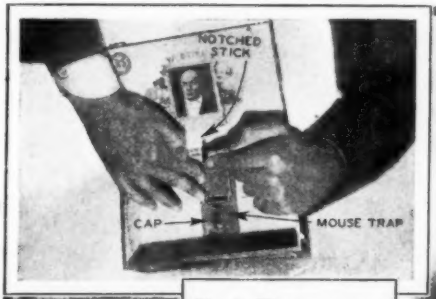


Fig. 3. The mouse trap is fastened to bottom of the explosive cigar box in position shown here. Stick on top holds trap when the box is closed.

Fig. 2. The victim of this simple joke is greatly embarrassed when he yanks and yanks at the handkerchief without being able to pull it up from the floor. Secret of joke is in the tack which holds the cloth down firmly.

which is good for any occasion for weeks afterward. Take an ordinary vest pocket comb and dip it in varnish or lacquer (clear) and let the covering harden in warm air.

Two coats will be best. The result is a comb which appears genuine but which will not comb hair! The comb can also be obtained from many novelty houses for 10 cents.

Non-lathering Soap Bewilders Victim

Put a fake bar of soap in the bath room for guests. This can be made at home in the following way. (See Figs. 9 and 10.) Get some sheet gelatin at the drug store and melt it down over a slow fire. Add a spoonful or two of water.

Fig. 4. Imagine the victim's surprise when he opens the box and hears the report of the trap snapping down in the cap. The trick can be worked over and over again.

Set a celluloid or aluminum soap box out handy, and when ready pour the gelatin in this for a form. Then set away to cool.

The inside of the box should be greased slightly to facilitate the removal of the "soap." It may be necessary to trim the edges slightly. You can give it a realistic look by actually using it a bit as you would soap, thus smoothing off all edges.

A small amount of some analine dye and also a couple of drops of perfume, will be worthwhile touches. What results when this soap is used, is no lather to begin with, and a thin film of the gelatin coats the hands which, if allowed to dry, gives a peculiar sensation. It can be washed off easily.

Victim Yanks Off False Hand

The loose hand trick is always good. It may need a bit of rehearsing, but is not difficult. The host or hostess greets the guests at the door. He wears kid or thin cloth gloves. As the guest enters he shakes hands, but to the momentary horror of the victim his hand comes off in the guest's.

Fig. 5. To make the fake peanuts, first remove the good kernels, then replace them with ordinary raw kidney beans, which serve as an imitation. Next, touch the edges sparingly with glue and press the halves of the shells together again, with beans inside.

Fig. 6. Plaster of Paris serves as the body of the fake peppermints. The discs of plaster of Paris are dipped in a cup full of real chocolate and allowed to harden.

Fig. 7. The snake which flies out of the can is made of a length of springy brass wire, wound on a broomstick as shown above to give it form, then covered with a green or red colored cloth, which is sewed loosely over the spring.

The right glove is stuffed with cotton and the right hand is drawn back slightly into the loose-fitting coat sleeve, as demonstrated in Fig. 2. The hand actually fits into the wrist of the glove and grasps the cotton firmly enough to make the glove appear natural. The stunt can be used over and over during the evening.

The Exploding Cigar Box

Cigars are quite in keeping with the progress of any party. So no suspicions are aroused when you pass the exploding cigar box, shown in Figs. 3 and 4.

Get an empty box which looks as if it had just been opened. Fasten a mouse trap, with the straight wire and staple removed, to the center in the manner shown in the photo, using small nails. Whittle a small stick, sharpened to a point at one end and with a notch in the other.

One-half inch from the inside edge of the cover, midway between the ends, make a small hole half way through the lid, with the point of your knife. Now move the jaw of the trap to "set" position, place the notched end of the stick over this and fit the point into the hole in the cover as you close it.

Mouse Trap Does the Trick

Raise the lid in the usual way. If things are working properly, the mouse trap will snap.

With everything in readiness, place a pistol cap at the edge of the strap so the jaw will strike it and fasten it there with a small brad. Or you can put the brad through from underneath and thus impale the caps upon this in firing position as needed. The unsuspecting victim will take the box and get the shock of his life.

This same trick is available at many trick and novelty houses in the form of a book which has a simple cap-firing mechanism in the back.

Another cap suggestion is to fasten several caps to the under edges of a chair rocker with bits of gummed paper. Sooner or later as the victim rocks back and forth, a concussion or two will break the moment's hilarity.

Here is one more good trick that can be used on the street. An imitation gold watch was wired to the iron grating in a sidewalk on a busy street about noon one April First. To prevent the tie from

Sheet Gelatin Melted in Pan to Make Bar of Trick Non-lathering Soap

Fig. 8. Place sign on box of genuine candy and set it on the table.

Fig. 9. First step in making the non-lathering soap is to melt the sheet gelatin down in a pan over a gas stove, as demonstrated. The melted substance should be colored.

showing, the wire was soldered to the under side of the case and the wires twisted beneath one of the grating bars.

About every five minutes the setting was good for a laugh. Some passerby spied the watch and stooped to pick it up. A burst of guffaws from across the street was his cue to go away from there. An average of 1 out of five pedestrians fell for the hoax.

Besides these home-made contrivances for April First fun, you will find no end of amusing devices at low cost on the market. A large group of manufacturers and jobbers make a specialty of trick contraptions which will produce the results desired when wanted.

It is suggested that you intersperse the stunts mentioned above with a few of these more complicated articles, to add to the fun. One trick spoon on the market gets a laugh when the victim finds that the bowl falls, spilling the contents over the front of his shirt and vest.

Fig. 10. Victim of this non-lathering soap joke is somewhat bewildered to find that the soap yields no suds.

Pencil Sharpener Shaped Like Automatic Pistol Has Eraser in Handle

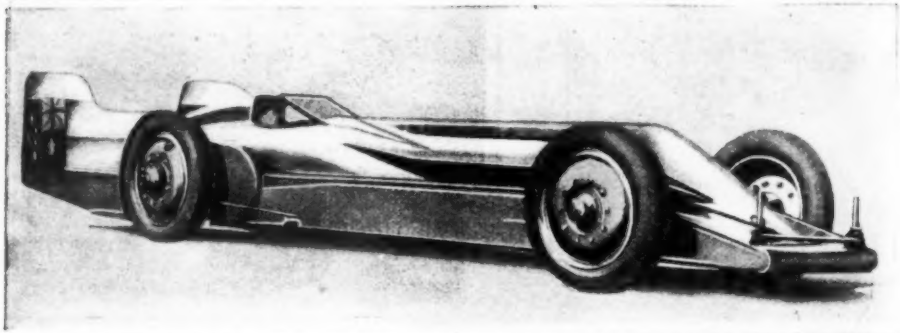
Pencil is inserted in the pistol barrel for sharpening.

ADDING interest to pocket pencil sharpeners by making them in the form of tiny phonographs, typewriters, horns, funny faces and other objects is the latest practice of manufacturers.

Perhaps the most novel sharpener, and at the same time the least lethal, of the lot has the shape of an automatic, as shown in the accompanying photo. The pencil is inserted in the barrel and the handle is then given a few turns. The space usually occupied by the firing mechanism holds the cutting blade, which is adjusted very easily by a screw.

At the bottom of the handle, where the clip is inserted in the regular pistol, there is an eraser that can be removed and used separately.

New Zealand Racing Car Seeks 300 M.P.H. Speed Record



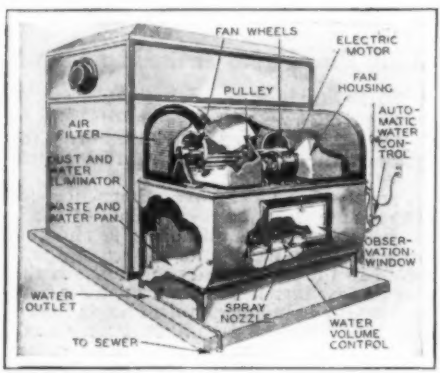
Here is recently completed racing car "F. H. Stewart Enterprise" with which "Wizard" Smith hopes to set 300 m.p.h. record.

A Weather Factory for the Home

AIR conditioning with its attendant benefits of health and comfort, is now available to the average family in a home "weather factory" which heats the air in winter and cools it in summer, and which is adaptable to warm air, hot water, steam or vapor-air systems.

The outfit is designed to be attached to the rear of a warm air furnace or may be used as an independent auxiliary with other kinds of heating plants.

Air first passes through a filter where much of the dust and dirt are removed and then, forced by two fans, operated by one-fourth horsepower motors, it rushes through swirling sprays of water from the house mains. This combined filtering and washing removes more than 98 per cent of the dust and dirt that the air may contain. Thus "laundered," the air goes into the furnace casing where it is warmed, in winter, in the usual manner and is distributed through the house.



In this new air conditioner for the home, the air first passes through a filter and then is forced through water spray. "Laundered" air is then warmed in furnace casing.

CONSTRUCTION of the "F. H. Stewart Enterprise," powerful racing car with which N. "Wizard" Smith, noted speedster, will attempt to set a 300 m.p.h. record, has at last been completed.

Powered by a twelve-cylinder Napier Schneider cup type engine, which develops 1,700 h.p., the machine is expected to establish a new record in time trials to be held in New Zealand. The car is shown in photo above.

Lights Show Vacant Theatre Seats

VACANT seats in movie houses can now be instantly spotted by ushers and patrons by means of tiny lights on aisle seats.

Each aisle seat has two tiny lights on the outside arm. If there are two or more vacant seats in the row, both lights remain lit. One light indicates one vacant seat.

Lights are small enough so that they do not bother those watching the performance.

Lights on seat arm, as shown in the photo above, indicate vacancies in row, facilitating the seating of theatre patrons.

Perpetual Motion From Weather

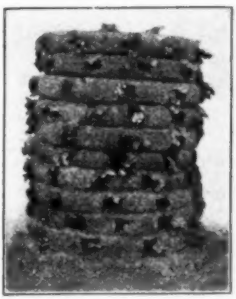
A MECHANIC of Carlslund, Sweden, has built a robot which has wound his clock continuously for fourteen years. The power that moves the clock is from weights which are able to keep the clock going for a year and a half. The robot rewinds these weights continually by the changes in temperature and air pressure.

New Feed Bag Enables Horse to Get to Bottom of Meal

HORSES in New York City no longer need throw their feed bag into the air to get to the bottom of their meal, thanks to the development of a bag which permits the horse full freedom of action. This new contrivance, shown in the accompanying photo, attaches to the collar instead of the halter.

New feed bag, attached to collar as shown, permits horse to eat with freedom and to get to the bottom of the meal.

Grow Strawberries in Old Tires

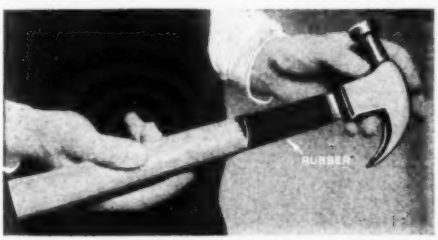


Strawberries are planted in holes cut in the tire casings.

OLD auto tires, stacked ten high, with square holes cut in the casing, make an excellent bed for strawberry plants. When two of the tires have been packed up with dirt, a pipe driven full of holes is set in place so that the plants can be watered. The plants are embedded in the square holes.

Tube Prevents Hammer Shock

RUBBER from an old inner tube, wrapped around the upper part of a hammer, as illustrated in the photo below, will reduce greatly the shock of a downward blow. After replacing the wedge, soak the handle in salt water so that it will fit tight. Also clinch the head to prevent slipping.



Rubber from old inner tube is wrapped around hammer handle as shown here to reduce shock of downward blow.

Russia Makes Rubber From Oil

BY a secret process on which scientists have been working since 1918, the Leningrad rubber trust factory in Soviet Russia has succeeded in producing a synthetic rubber from oil, the cost of which is said to be low enough to compete successfully with real rubber as a commercial product.

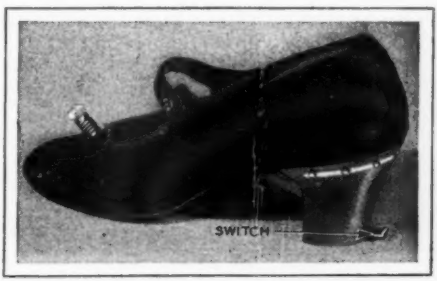
Half a ton of the synthetic product has been turned over to the "Red Triangle Factory" for the manufacture of saleable goods.

Light on Shoe Puzzles Onlookers

TIPPED with a small electric light bulb which may be set in a rosette, a novel dancing slipper has a battery concealed in the hollow aluminum heel.

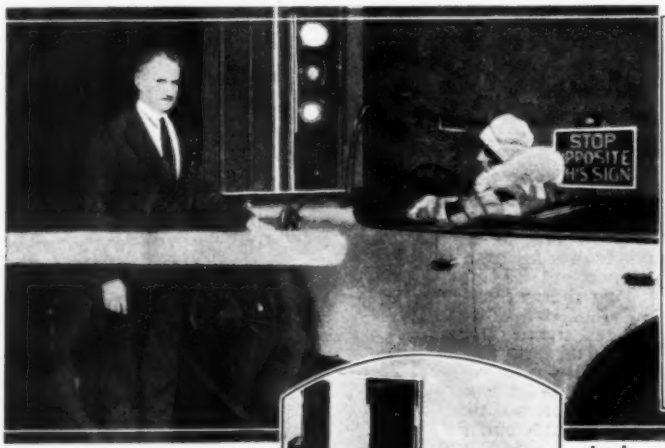
At the bottom of the heel is an especially constructed switch which is operated by the dancer by kicking the back of the heel on the floor. The flashing on of the light at will is mystifying to the onlooker, as it has apparently been accomplished without any connection of any kind.

In the chorus of a stage show the illuminated shoes proved a striking innovation.

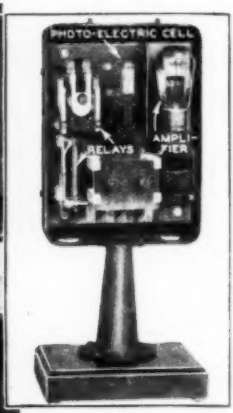


Small electric light in toe of dancing shoe is turned on by striking heel switch to floor. Small battery is in heel.

New Electrical INDUSTRY



The electric eye counts vehicles passing through Holland Tunnel, New York. Interruption of beam works the counting mechanism.

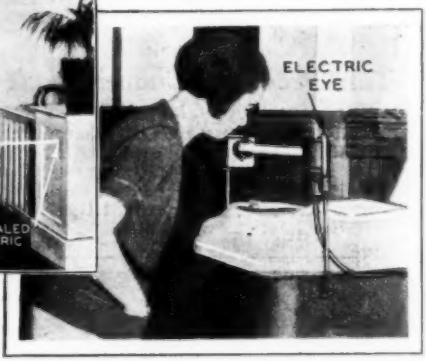


Industry's newest tool, the electric eye, with relays and amplifier.

by

Robert Francis

The electric eye, which functions as a virtual automatic brain, is working miracles in industry, and may soon oust the human brain and hand from the control levers of machinery. This field offers many new opportunities.



Above — The electric eye saves opening service doors in the restaurant. When waitress crosses beam, photo-cell actuates door opening mechanism. Below—When you bend over for drink of water, this fountain is automatically turned on by electric eye. As head is raised from jet, the beam from light strikes the "eye" again and turns off the water.

THE most promising, the most amazing and without doubt the most fascinating field of endeavor today is electronics, the baby billion-dollar industry.

Indeed there is no industry in America however large, however undeveloped, however needful of bright young minds and willing young hands, that can offer even a small percentage of the opportunities that are literally begging acceptance in electronics.

But what is electronics? What is this new bonanza of opportunity?

Like its parent, electricity, electronics is finding its way into hundreds of industries, and at so rapid a pace that trained men cannot be found fast enough.

A hot billet of steel rushes and plunges back and forth under a rolling mill unguided by human hands. It obeys nothing but a beam of light.

A flash-over occurs on a large and powerful dynamo supplying a small city with its electric lights. Although no human is present, this great piece of brute mechanism is brought to rest before it burns itself to pieces. A little tube no larger than a crab apple stops it.

Feats Performed by Electric Eye

Packages of cereal are rudely snatched from a conveyor belt because they have been improperly wrapped and a little electric eye has detected them and thrown them into the discard.

A wire-making machine suddenly and abruptly stops because something slipped and the wire coming from it is no longer of the proper size. It stopped itself, because

Creates Mechanical Brains

its electronic brain brought it to a stop.

The brakes of a locomotive are automatically applied at the entrance to a block, an elevator stops at exact floor level, the conveying machinery of a steel mill stops when the bin is filled, and the tonsils of patients are removed without the shedding of blood.

We could go on and mention hundreds of other applications of electronics but space will not permit even a small percentage of the conquests of this new art to be outlined.

It amounts to the most astounding engineering achievement of the century; the new and golden age of automatic control where the human eyesight, the human hands and even the human brain is replaced by the controlled flow of electrons; the same electrons that light our lights, toast our bread and send our radio messages.

Electronics a Billion Dollar Industry

Within the next few years billions of dollars worth of electronic equipment will be sold and thousands of young men trained in the new and fascinating art will be needed to install it and to care for it. No industry will be able to escape the changes it will bring about and no young man can afford to overlook the opportunity that calls with such positive conviction.

Even today the electronic engineer is the man of the hour. Yesterday he saved a steel mill a hundred thousand dollars a year, tomorrow he may revolutionize another industry by the ingenious application of his little tubes that work so much magic, that lift such heavy loads from the backs of men.

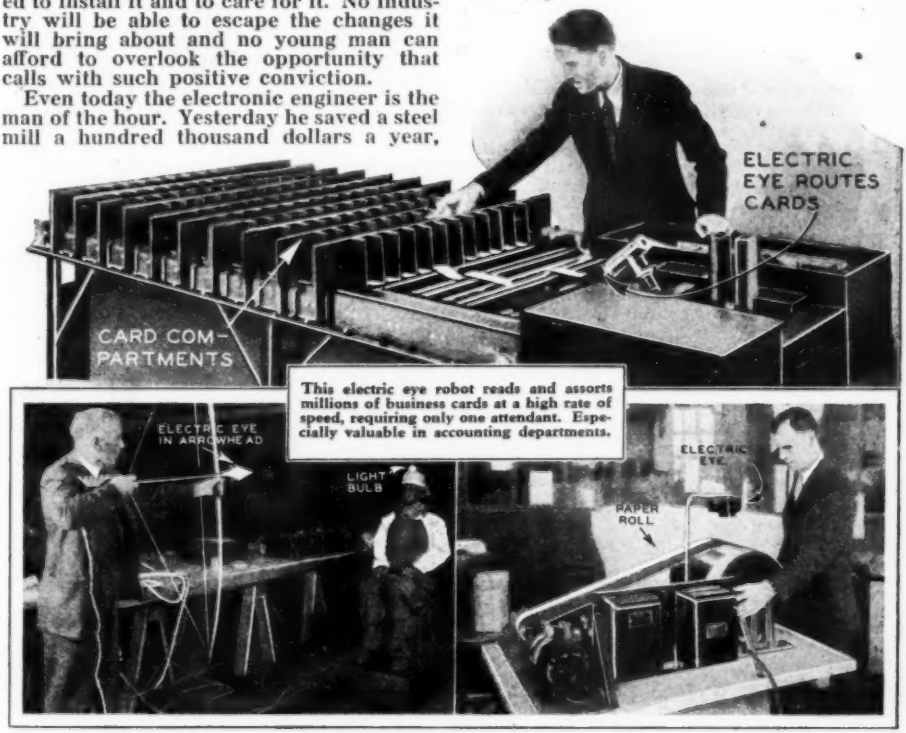
It is rather difficult to fully appreciate the possibilities of this new art. One of its most important tools is the photo-electric cell, commonly called the electric eye.

At the present time there are over one hundred applications of this amazing device. We find it in a dozen industries doing chores that save money and speed up operations that were formerly controlled by the human eyesight.

Industry Needs Trained Young Men

What the future holds for it can only be awkwardly guessed at, so alluring are its prospects. Hundreds of new applications are being held for bright young men to find —young men trained to see such things.

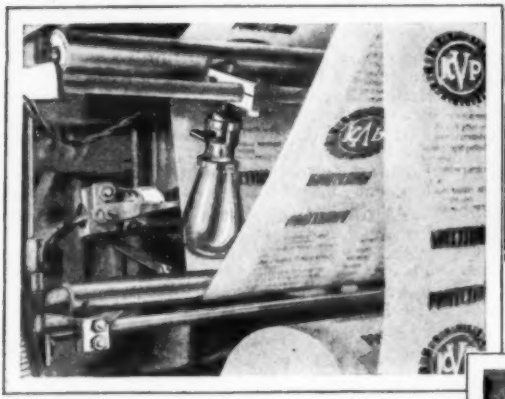
It is very difficult to describe the field of electronics in so many words because its ramifications are so great; indeed so utterly confusing to one who knows little about the subject.



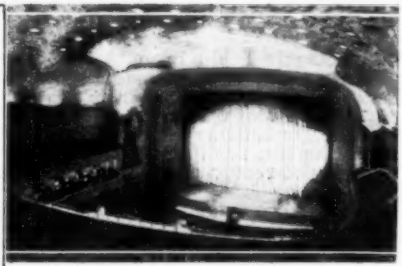
This electric eye robot reads and assorts millions of business cards at a high rate of speed, requiring only one attendant. Especially valuable in accounting departments.

The William Tell act performed in the modern scientific manner. Light on robot's head is extinguished when electric eye in arrow head is focused on it. Right—A greater degree of accuracy in testing the compactness of fiber structure of paper results from use of this new photo-electric unit for automatically timing tests.

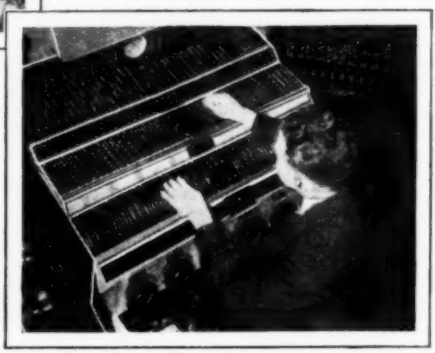
Photo-Cell Watches Press for Paper Breaks and Prevents Wrap-Arounds



Set to detect breaks in paper running through a printing press, the electric eye stops the mechanism when white light reflected from the paper is interrupted.



The thyratron tube has brought to the theatre new possibilities in lighting effects. Above is shown Severance Memorial Hall, Cleveland, where light scheme was introduced, to astonishment of audience.



Sitting at this organ control board the electrician has every light in the Severance Memorial Hall at his finger tips and can virtually play a symphony of color on the scene. The master control gives proportional dimming and permits four scenes of the performance to be set up in advance.

The best the writer can hope to do within the confines of this comparatively short article is to describe some of the tools of the electronic engineer. It is the marvelous devices that he has to work with that lead us to fully appreciate the prospects in store for those who succeed in mastering the new art.

As previously stated, in the photo-electric cell we have a device that replaces the human eye.

In the grid-glow tube, another electronic instrument, we have a device that in a way functions as a substitute for human feeling; it is sensitive to touch, even a wave of the hand being sufficient to control it.

Electric Eyes to Control Factories

Then we have the ordinary vacuum tube and here the writer predicts that some day vacuum tubes will be used more in industry than they are in home radios.

Then we must not forget the thyratrons, the pliotrons and the many other electronic tubes and the wonderful things that they do. The thyratron is a most versatile device capable of performing real miracles. It is able to control large sources of electrical energy without moving parts like switches, or relays.

Perhaps the reader will be able to better appreciate the great field of electronics if the writer outlines some of the industries and arts that are now using electronic devices.

Field of Service Unlimited

The following industries might be mentioned: steel, rubber, paper, cigar making, glass, paint, textiles, railroads, rolling mills, wire-making, mining, conveying, dyestuffs, chemical manufacturing, metal stamping, coal, etc.

When we come to a list of the arts that have been affected and benefited by electronics we begin to realize what a vast and profound human discovery has been made. Here we have: sound pictures, counting, grading, carrier systems, beam transmission, measurements, music, therapeutics, traffic control, machine control, metering, analysis (chemical and metallurgy), crime detection, geophysics, aviation, etc.

This may all sound very fine and very alluring to the ambitious young man who would throw his lot to it, but he will naturally ask: "What must I do to train myself for this work and how much will my services be worth to people who can make use of them?"

How to Acquire Training

If the writer were to advise any young man in this matter of training, he would unhesitatingly recommend a general training in radio and he would specialize not in radio transmission or reception, but in the function of radio tubes and in the radio circuits that apply to amplification.

Here lies the great foundation work of electronics. In training of this sort, a young man will be able to equip himself with the great fundamentals of the electronic art.

(Continued on page 186)

Sheriff SHOWS Disarming TRICKS

When a hold-up man attacks from the front, the trunk is twisted to the left, as shown by J. H. Fitz Gerald above, and the right hand brought down in a flash, seizing the gunman's weapon and thrusting it away from the abdomen. Pointed parallel to abdomen, the gun is harmless.

THE safest and most effective method of disarming a hold-up man was demonstrated by J. H. Fitz Gerald, well-known firearms authority, at a sheriff's convention held recently.

In case a thug approaches from the front, prods a gun in his abdomen and tells him to reach for the stars, Mr. Fitz Gerald twists his trunk quickly to the left, brings his right arm down in a flash, seizing the pistol and at the same time thrusting it outward.

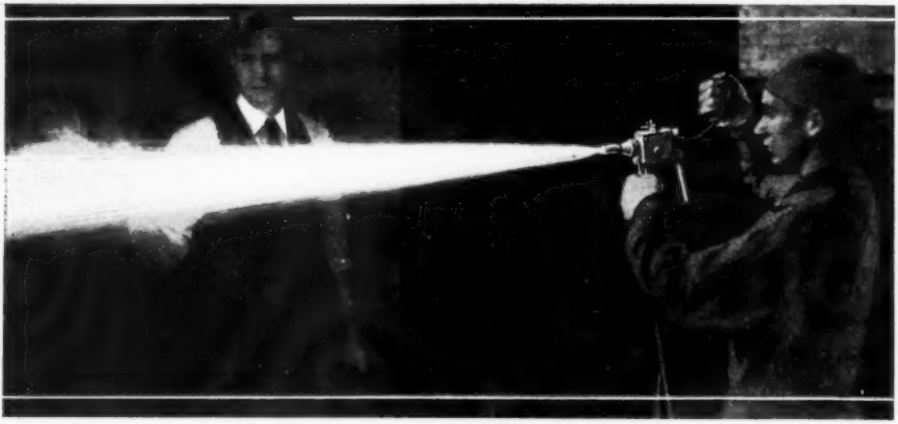
In disarming a hold-up man who attacks from the rear, Mr. Fitz Gerald turns quickly to the left, bringing his left arm down and backwards as demonstrated.

In the situation depicted above, where the highwayman approached from the rear and thrust a gun in his back, Mr. Fitz Gerald first twists the body quickly to the left, bringing the left arm down and under the assailant's arm. High speed action is the chief requisite in carrying out successfully this first step if injury is to be avoided.

Left—Second position in disarming a hold-up man. The left arm of the sheriff is slipped around the gun arm of the highwayman, so that the pistol is pointed out over the shoulder, thus rendering it harmless in case of discharge. The right arm is then free for defense or for delivery of a few telling body blows to the assailant. With arms thus interlocked the sheriff is free to apply a little jiu-jitsu by closing his arm so that the bandit's arm is held securely.

Final steps—Gunman's hand is bent sharply backward, then the pistol is grasped and pulled down, breaking trigger finger.

New Process Coats Glass or Wood With Rust-proof Metal



Wood, glass, cloth, etc., are coated with metal by spray from special metallizing gun. The protective coating is rust-proof.

Fireproof Paint Halts Blazes

A NEW fireproof paint recently introduced renders wood practically non-inflammable when applied to the surface.

In a test conducted to demonstrate the fire-resisting properties of the paint, a fire which burned for thirty minutes on the roof of a tiny building failed to spread, and only charred the shingles directly beneath the blaze. The little structure, shown in the photo below, was completely coated with fireproof paint.

The coating is applied with a brush in the manner of any commonly used paint.

Here is shown result of thirty minute blaze on shingles coated with new fireproof paint. Fire did not spread and the shingles were only slightly charred in the test.

WITH hundreds of practical uses to which it can be applied, a new liquid metallizing process has recently been perfected which makes it possible to protect against weathering oxidation metal objects which must endure constant exposure to the air.

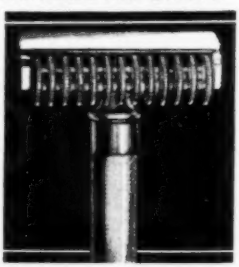
Certain metals are immune to the destructive elements of the atmosphere, but are too expensive to be used in solid form. The metallizing process makes it possible to apply a thin expensive coat of oxidation-proof metal to objects made of less costly but more vulnerable metals, thus preventing rust.

Metals in wire form are fed into the special metallizing gun, as shown above, where it is melted and comes out of the gun in liquid form under such high pressure that it adheres to the surface of the base metal or material.

Wood can easily be metallized, as well as glass, plaster and numerous other materials, including cloth.

Razor Discs Press Skin for Shave

A NEW safety razor now being marketed is equipped with a row of discs which insure an easy and perfect shave without cuts or irritation of the skin. These discs, preceding the blade in the shaving process, roll against the skin and stretch it slightly, so that the cutting edge can do its work effectively. The strong pressure that can be achieved brings the blade just at the base of the hair, providing the utmost in way of a clean job.



Discs on razor press down flesh, giving clean, close shave.

PLANE TALK

Edited by DOUGLAS ROLFE

German Tail-FIRST Plane is Stall-Proof

WE ARE used to seeing planes which fly with the tail surfaces trailing behind. So much so, in fact, that the very idea of a plane flying in any other than this accustomed position seems a trifle out of place, if not downright ridiculous.

When we are reminded that the first truly successful plane, the Wright Brothers famous biplane, was of the tail-first type we are apt to dismiss it as one of the absurdities of very early aviation and point to the fact that the practical planes of today all follow the standard practice of having the main, or large plane, in front, and that this is the *only* possible way to achieve safe and proper flight.

Focke-Wulf Success

But is it? This is the question which is engaging the minds of more than one experienced airplane designer today. The recent successes of the Focke-Wulf company, well known German airplane manufacturers with a radical tail-first or "Canard" type of plane, have attracted world wide attention and we may confidently look for a further development of this type of plane.

What advantages can be gained by employing the tail first principle? What precisely is the Focke-Wulf "Canard" and wherein does it differ from the ordinary plane? The answer is brief and of vast importance to the further safety of planes.

A properly designed "Canard" plane cannot be stalled, it seems to produce a greater lift than the conventional type of plane, and it is literally impossible to nose it over in landing.

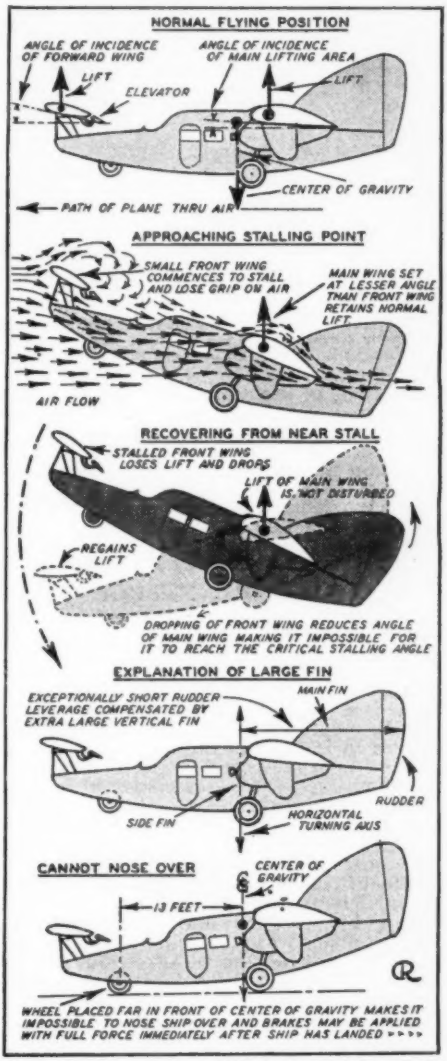
Of all the strange "birds" the Focke-Wulf "Canard" is certainly one of the strangest in appearance. Resembling in profile a racing car of the type made familiar by the speed contests at Daytona Beach, it is a twin motor cabin monoplane with the main lifting surface situated at the rear and the "tail," or forward lifting plane, mounted at the forward end of the fuselage.

Stalling Prevented

This forward plane, which is comparatively small, is set at a much larger angle of incidence than the main wing and consequently, if the machine approaches anything near a stalling angle, will stall long before the main wing has assumed this dangerous angle.

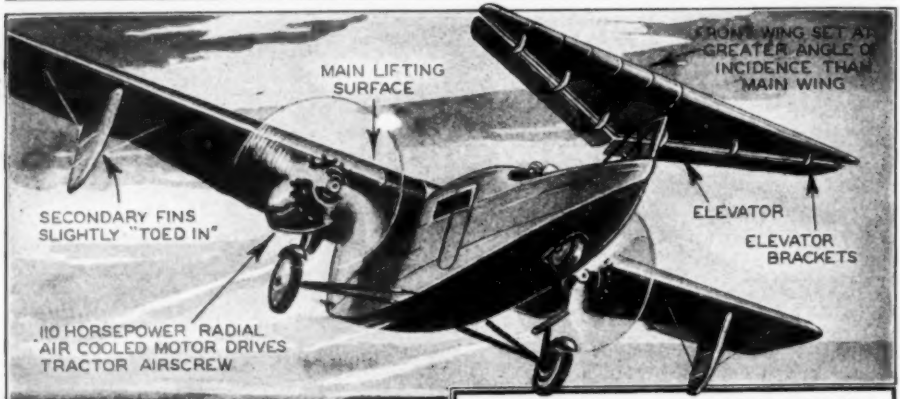
The moment the front wing stalls it loses lift and drops, thereby dropping the whole nose and correcting the dangerous angle automatically.

In a normal plane a stall involves a total


NORMAL FLYING POSITION
ANGLE OF INCIDENCE OF FORWARD WING
ANGLE OF INCIDENCE OF MAIN LIFTING AREA
LIFT
ELEVATOR
LIFT
CENTER OF GRAVITY
PATH OF PLANE THRU AIR
APPROACHING STALLING POINT
SMALL FRONT WING COMMENCES TO STALL AND LOSE GRIP ON AIR
MAIN WING SET AT LESSER ANGLE THAN FRONT WING RETAINS NORMAL LIFT
AIR FLOW
RECOVERING FROM NEAR STALL
STALLED FRONT WING LOSES LIFT AND DROPS
LIFT OF MAIN WING IS NOT DISTURBED
REGAINS LIFT
DROPPING OF FRONT WING REDUCES ANGLE OF MAIN WING MAKING IT IMPOSSIBLE FOR IT TO REACH THE CRITICAL STALLING ANGLE
EXPLANATION OF LARGE FIN
EXCEPTIONALLY SHORT RUDDER LEVERAGE COMPENSATED BY EXTRA LARGE VERTICAL FIN
MAIN FIN
RUDDER
SIDE FIN
HORIZONTAL TURNING AXIS
CANNOT NOSE OVER
CENTER OF GRAVITY
13 FEET
WHEEL PLACED FAR IN FRONT OF CENTER OF GRAVITY MAKES IT IMPOSSIBLE TO NOSE SHIP OVER AND BRAKES MAY BE APPLIED WITH FULL FORCE IMMEDIATELY AFTER SHIP HAS LANDED

An explanation of the principal characteristics of the Focke-Wulf "Canard" is given in the drawings above. When properly designed, such a plane cannot be stalled. It produces a greater lift than the conventional type of plane, and is impossible to nose over upon landing.

"Canard" Type Plane Always Remains in Its Normal Flying Position


MAIN LIFTING SURFACE
FRONT WING SET AT GREATER ANGLE OF INCIDENCE THAN MAIN WING
SECONDARY FINS SLIGHTLY "TOED IN"
ELEVATOR
ELEVATOR BRACKETS
110 HORSEPOWER RADIAL AIR COOLED MOTOR DRIVES TRACTOR AIRSCREW

Strange as it may seem, this is a front, and not a rear view, of the "Canard." The motors and fuel tanks are completely separated from the fuselage. The absence of propeller wash around the fuselage reduces the noise.

loss of lift of the main lifting surface but in the case of the "Canard" it is merely the small front wing which stalls. At no time is there any danger of total loss of lift of the main wing (see drawing). Since stalling, and the subsequent loss of lift, is one of the outstanding dangers of airplanes today, it can readily be seen that in this case at least the "Canard" type plane offers substantial results.

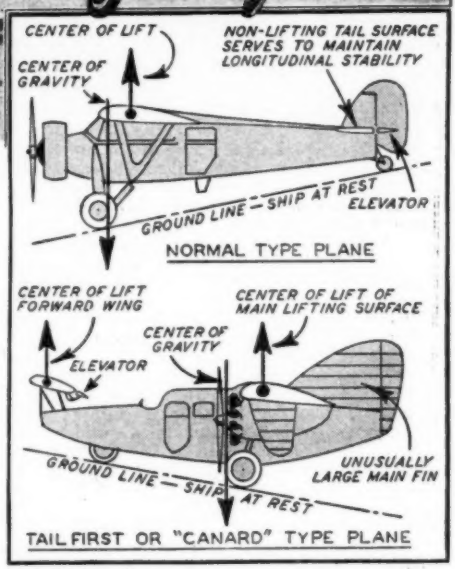
"Canard" Can't Nose Over

Another interesting and important point of the design is the relation of the center of gravity to the three wheeled landing gear. Situated as it is just in front of the main wing, the center of gravity lies some thirteen feet behind the front wheel. This arrangement permits the full use of wheel brakes in landing at the exact moment of contact with the ground. There is no danger of nosing over and the plane can rapidly be brought to a complete standstill with utmost safety.

Other safety features peculiar to this design are its anti-spin characteristics and the fact that the motors and fuel tanks are completely divorced from the main fuselage and passenger cabin. There is no violent propeller wash disturbance around the fuselage—one of the most serious drawbacks to the conventional plane and, incidentally, a large factor in the noise problem of the airplane.

Low Speed a Drawback

The Focke-Wulf plane is admittedly in an experimental stage and therefore suffers from certain drawbacks. Chief among these is its poor performance, particularly in the


CENTER OF LIFT
NON-LIFTING TAIL SURFACE SERVES TO MAINTAIN LONGITUDINAL STABILITY
CENTER OF GRAVITY
GROUND LINE — SHIP AT REST
ELEVATOR
NORMAL TYPE PLANE
CENTER OF LIFT FORWARD WING
CENTER OF LIFT OF MAIN LIFTING SURFACE
CENTER OF GRAVITY
ELEVATOR
UNUSUALLY LARGE MAIN FIN
GROUND LINE — SHIP AT REST
TAIL FIRST OR "CANARD" TYPE PLANE

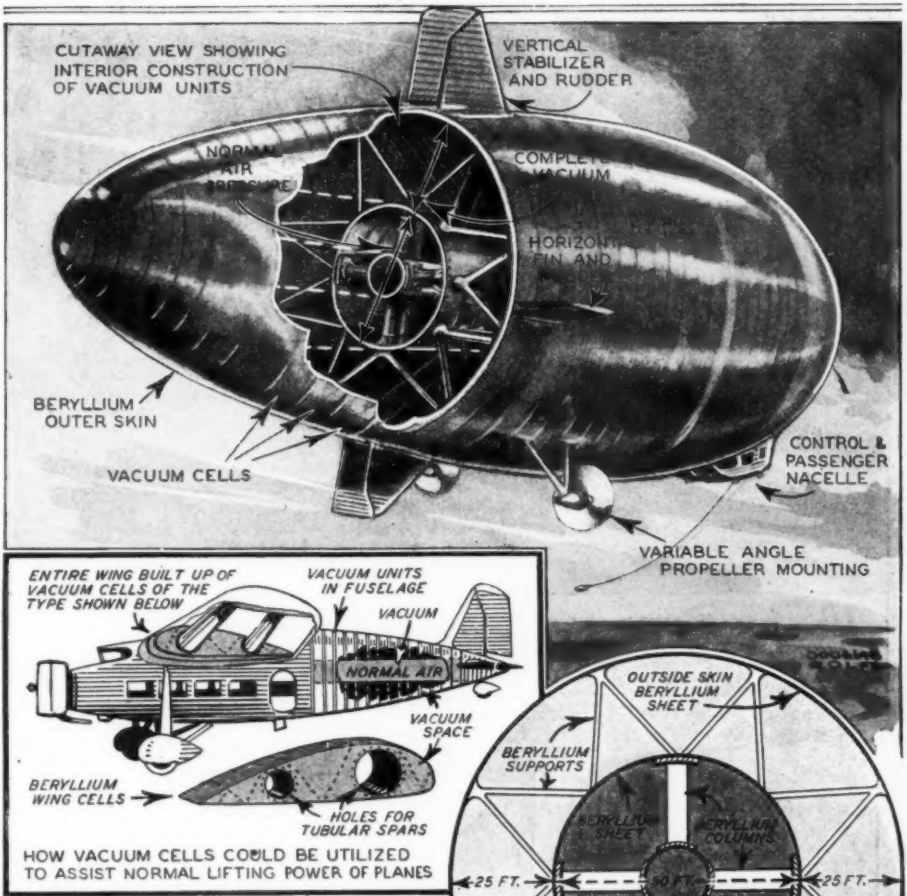
An important point in the design of the "Canard" is the relation of the center of gravity to the landing gear. There is no danger of nosing over on landing or taxi-ing.

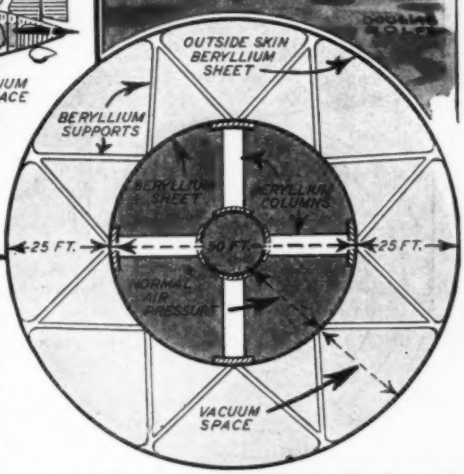
matter of speed, with due regard to the horsepower employed.

Powered with two 110 horsepower radial motors it carries three passengers and pilot at the rather low cruising speed of 79 miles an hour. Even using full power it can only do something like 89 miles an hour, but because of its exceptional safety qualities it has passed the difficult official tests and been approved by the German government for public service.

All in all we may look for striking developments of this class of ship and it would be a wise person indeed who could say that the conventional plane of today represents the last word in design and as such will stand unchanged.

Gasless DIRIGIBLE for Safe Air Travel


CUTAWAY VIEW SHOWING INTERIOR CONSTRUCTION OF VACUUM UNITS
VERTICAL STABILIZER AND RUDDER
BERYLLIUM OUTER SKIN
VACUUM CELLS
CONTROL & PASSENGER NACELLE
VARIABLE ANGLE PROPELLER MOUNTING
ENTIRE WING BUILT UP OF VACUUM CELLS OF THE TYPE SHOWN BELOW
VACUUM UNITS IN FUSELAGE
VACUUM
NORMAL AIR
VACUUM SPACE
BERYLLIUM WING CELLS
HOLES FOR TUBULAR SPARS
HOW VACUUM CELLS COULD BE UTILIZED TO ASSIST NORMAL LIFTING POWER OF PLANES



The upper drawing shows the structural details of the projected gasless all-metal dirigible. Beneath it is shown the arrangement of vacuum units in a large plane.

A cross-section of the gasless dirigible. The inner unit will be filled with air at normal pressure, while beryllium girders will prevent the vacuum unit from crushing.

EVEN the most rabid enthusiast cannot defend the weakness of the hydrogen-fill dirigible. Death and destruction lurk in every cubic foot of it. Human ingenuity has failed to devise a means of making it safe and the prospect of riding the air with 2,000,000 cubic feet of a violent explosive over one's head is not alluring, at least to those who have had laboratory experience with the energetic hydrogen atom.

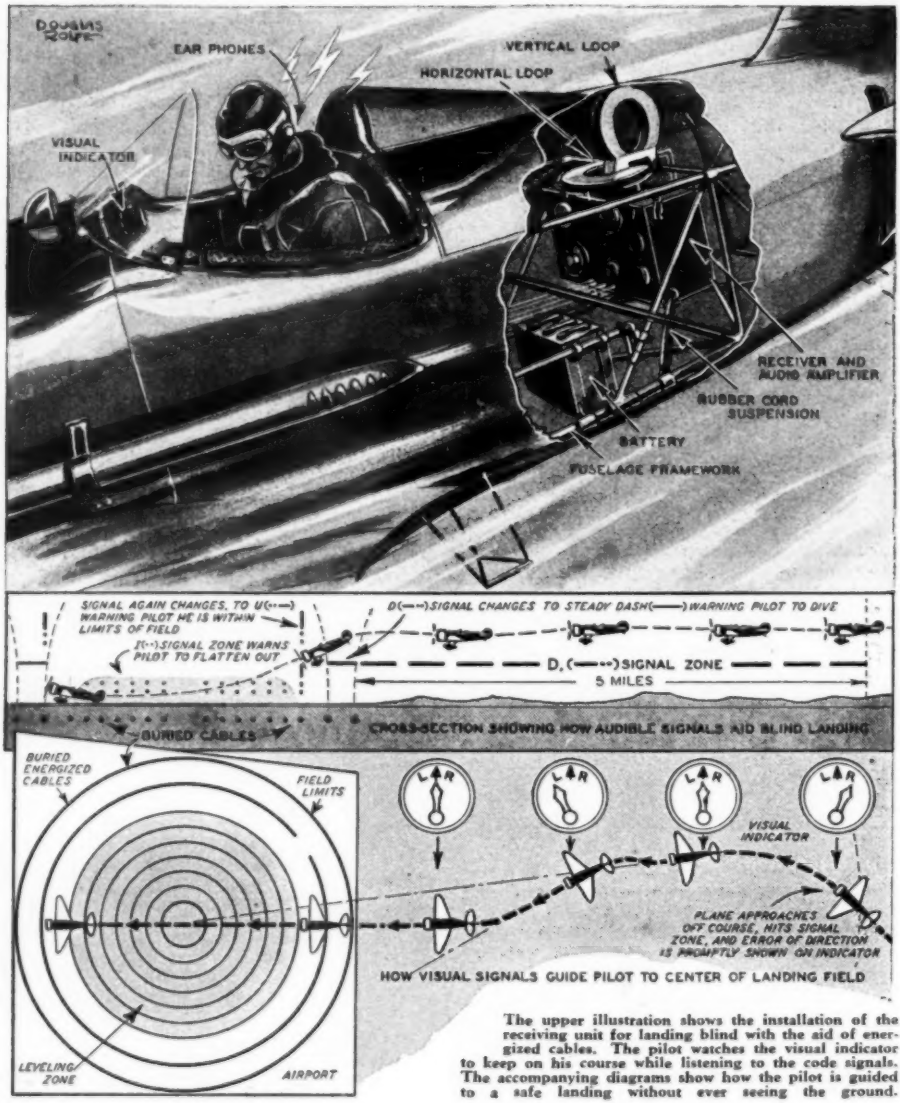
Of course, the thoughtless answer is: We shall use helium. That reminds the writer of the drunkard who came home and was told by his wife that not a crust of bread was in the house, whereupon the good wife was told to eat pie. Helium is far more than pie as compared with the cheap and plentiful hydrogen. There simply is not enough helium to go around.

But why use any gas at all? Before we delve into this fascinating possibility, let us get the physics of it straight in mind.

Let us assume that we have a metal ball, say one foot in diameter. The ball is of tin and we connect it to a vacuum pump which sucks all of the air out of it. However, long

(Continued on page 184)

Energized CABLES for BLIND Landing


DOUGLAS ROUTE
EAR PHONES
VERTICAL LOOP
HORIZONTAL LOOP
VISUAL INDICATOR
RECEIVER AND AUDIO AMPLIFIER
RUBBER CORD SUSPENSION
BATTERY
FUSELAGE FRAMEWORK
SIGNAL AGAIN CHANGES, TO U(··—) WARNING PILOT HE IS WITHIN LIMITS OF FIELD
D(—··)SIGNAL CHANGES TO STEADY DASH(——)WARNING PILOT TO DIVE
U(··)SIGNAL ZONE WARNS PILOT TO FLATTEN OUT
D, (—··)SIGNAL ZONE
5 MILES
BURIED CABLES
CROSS-SECTION SHOWING HOW AUDIBLE SIGNALS AID BLIND LANDING
BURIED ENERGIZED CABLES
FIELD LIMITS
L A R
VISUAL INDICATOR
PLANE APPROACHES OFF COURSE, HITS SIGNAL ZONE, AND ERROR OF DIRECTION IS PROMPTLY SHOWN ON INDICATOR
HOW VISUAL SIGNALS GUIDE PILOT TO CENTER OF LANDING FIELD
LEVELING ZONE
AIRPORT

The upper illustration shows the installation of the receiving unit for landing blind with the aid of energized cables. The pilot watches the visual indicator to keep on his course while listening to the code signals. The accompanying diagrams show how the pilot is guided to a safe landing without ever seeing the ground.

WILLIAM LOTH, the French engineer, who for the past fifteen years has been at work on maritime and aeronautical aids to navigation, has developed a system of energized cables which permits a pilot to fly directly toward the center of the airport, warns him when he is approaching the field, tells him when he has passed the boundaries, and warns him when to level off to land.

A full scale equipment has been installed at Wright Field, and is being tested by the Army Air Corps. Full results of the tests, however, have not yet been possible, owing to the fact that the power available has not been sufficient to operate the leveling system.

Reception on this device does not require the usual radio operation of tuning to a certain station, but makes use of a simple audio amplification equipment operated by merely throwing a switch.

Thrills With New Type Balloon

BALLOON jumping, that spectacular and thrilling but highly dangerous sport, may receive new impetus from the successful demonstration of a new type of equipment invented by Jean Cambissa of Korfu, Greece.

The balloon, of 100 cubic meters capacity, lifts a light metal frame upon which the pilot sits while he flaps a pair of wings with his arms. These wings, together with a rudder operated by the feet, give the pilot a certain amount of control—something which was entirely lacking with the old balloon jumpers.

Three Danger Periods for Pilots

THREE mysterious danger periods in the flying life of an amateur airplane pilot are disclosed by statistics reported recently to the Royal Aeronautical Society, in London, by Captain A. G. Lamplugh, British expert on aviation insurance.

The first time when the amateur pilot is likely to have an accident, Captain Lamplugh finds, is after he has had 20 hours of flying experience and before he has had 30 hours.

Increase of accidents at this time probably is due, it is concluded, to mistakes made when the new pilot first tries to fly without an experienced flyer at a duplicate set of controls.

The next danger period, the statistics indicate, is between the pilot's 80th flying hour and his 120th. This is the most dangerous time of all and is attributed by Captain Lamplugh to over-confidence. With eighty hours of experience the beginner feels able to meet any emergency, which he is not. Some unfamiliar chance of flying appears and wrecks him.

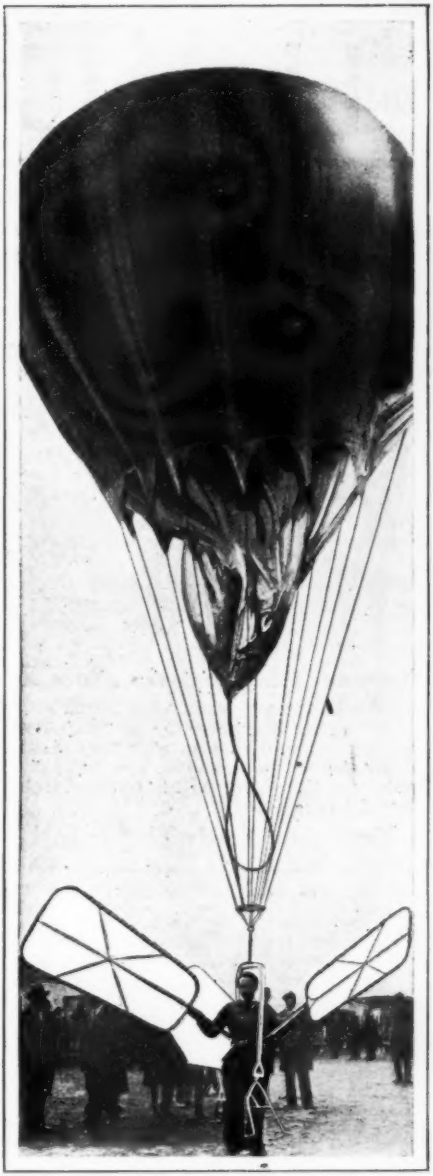
Finally, there is a more mysterious peak of accidents among amateur pilots having between 500 and 600 hours of flying experience. One suggestion is that this third peak of the accident curve may be due to another kind of over-confidence, to facing weather conditions in which a more experienced pilot would refuse to fly.

Sometime between his 500th flying hour and his 600th one, this theory suggests, the average amateur pilot is likely to keep on flying in some dangerous weather which tasks his skill and equipment to the limit. If this does not kill or injure him, he knows enough thereafter to let such dangerous weather alone

Balloon Shower Worries Germans

AMATEUR English weather scientists recently conceived the plan of releasing small gas-filled balloons, to which a return post-card was attached, hoping that when the cards were returned they would be able to obtain valuable data regarding wind directions over Europe.

The scheme was wrecked, however, by the suspicions of the Germans. Fearing that it was some means of subtle propaganda, the police directed that the cards should not be returned.



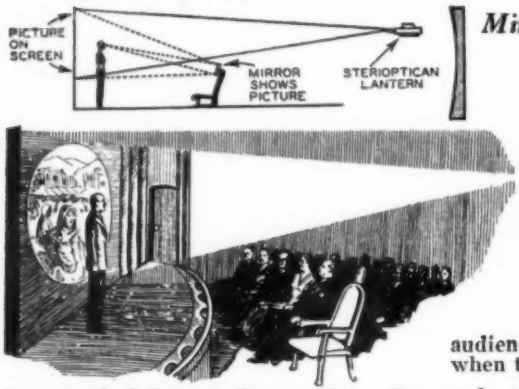
Jean Cambissa about to go for a hop. The wings, propelled by the pilot, give directional control to the balloon.

Crash-Proof Tanks for Planes

IT IS reported that the aeronautical research department of the Bureau of Standards has found a "new elastic and strong synthetic material having many qualities of rubber but insoluble in gasoline or oil." The material is to be tested for crash-proof tanks for airplanes.

HANDIKINKS

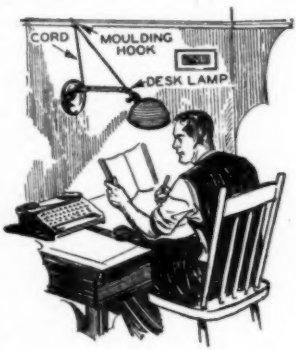
Handikinks department brings to you helpful little stunts and ideas that will aid you in the performance of tasks about the house, in the work shop or garden; in fact, any place where there are simple tasks to be done.



Mirror on Chair Prompts Lecturer

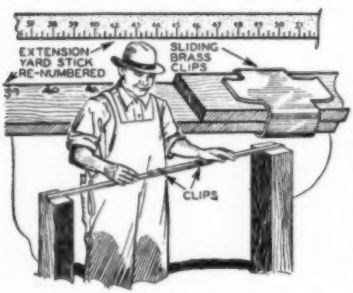
LECTURERS often find themselves at a loss for a scheme to watch the picture while they are facing the audience. An excellent stunt that will solve this problem makes use of a concave mirror, of the type that can be found for about twenty-five cents on any chain store counter. This mirror is fitted with a little clamp, which should be secured to the back of a seat, as illustrated in the accompanying drawing. From the mirror the entire picture on the screen is reflected back to the lecturer's eyes, as he stands facing the audience. The lantern operator shifts slides when the lecturer hesitates.—L. B. Robbins.

Suspended Lamp Gives More Room for Work



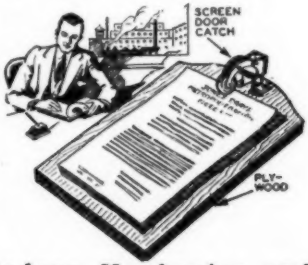
DESK lamps are often very much in the way when you are using a typewriter or large notebook. But if the lamp is suspended from a picture moulding by a cord, as illustrated in the drawing, you can make use of the whole table, and the paper will not reflect light into your eyes.—Edwin Emmons.

Extension Yardstick for Inside Measuring



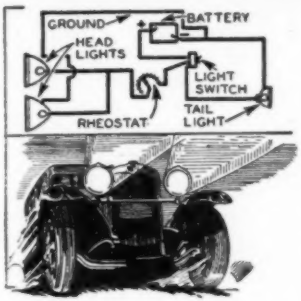
FOR certain work it is desirable to make an inside measurement, that is, between two surfaces, the edges of which are not usable. An extension yardstick, such as is shown in the accompanying drawing, does the trick here. Secure two yardsticks of precisely the same dimensions and plane the numbers off one of them. Then make the two clips which hold the sticks together, and mark the planed stick with figures beginning with 37, numbering them backwards, however.—Morris Hall.

Pad Holder From Screen Door Catch, Plywood



IF YOU'RE in need of a good pad holder, try this little stunt. First, stage a raid on some place where a screen door has been, or else visit a hardware store, and obtain a screen-door catch. Next cut out a piece of plywood about the size you want the pad to be. With this much done, your next job is to secure the catch to plywood, so that the result is the contraption shown in the accompanying drawing. While such a pad holds the sheets of paper firmly, it also permits them to be quickly removed without injury.—Altamont Cole.

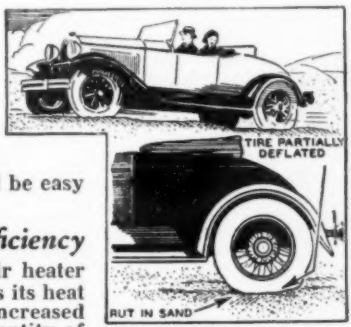
Stunts for Greater Auto Efficiency



Dim Auto Headlights With Radio Rheostat

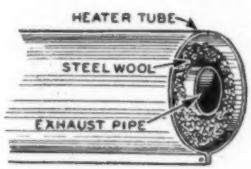
PROGRESSIVE dimming of headlights is possible if you hook up the lighting circuit of your car as illustrated in the wiring diagram at the left. An ordinary radio rheostat will suffice for the job, since the battery delivers only six volts. As to its location, you can bolt it to any part of the dash that proves most convenient. Wiring is extremely easy; simply open the circuit between the switch on the dash and the two headlights and hook in the rheostat. When all of the rheostat is in the lights will be at maximum dimness; when all of circuit is out, you will have lights at maximum brightness. Such a system will go a long way towards conserving your battery.—Harry Hubbel.

Deflate Tire to Pull Car Out of Sand Rut



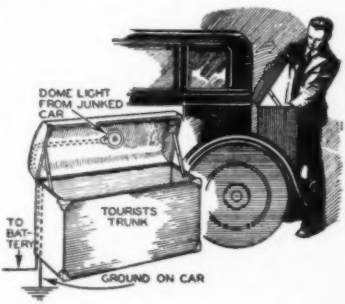
THERE is a remarkably simple stunt for pulling your car out of a sand rut when you get stuck. With your rear wheels sunk in dry sand, don't dig deeper by applying the power. Merely get out and deflate the tire to about half normal pressure, as illustrated in the accompanying drawing, and start out gradually in low. With increased traction, it will be easy to make the grade.—Don Levine.

Steel Wool Packing Increases Heater Efficiency

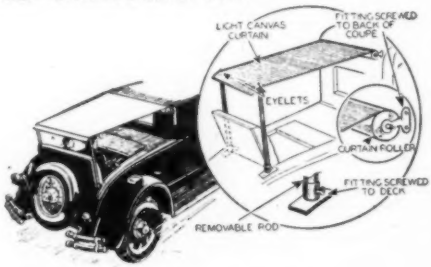


THE efficiency of a hot air heater of the type which derives its heat from the manifold can be increased tremendously if a small quantity of steel wool is packed lightly between the exhaust pipe and the tubing which conducts the hot air to the interior of the car. The steel wool quickly absorbs the heat of the manifold permitting the air to flow through a greatly increased surface area of heated material. You will be surprised how rapidly the car heats up with this scheme.—S. L. Witman.

Light on Lid Helps Find Articles in Trunk



HERE is a simple kink which will be found a boon to tourists—a light mounted on the inside of the lid of the traveling trunk. A discarded dome light, with switch attached, can be bought for a few cents at any auto wrecking yard. This is screwed to the inside of the lid, as illustrated in the accompanying drawing, and wires are led to the battery and to the frame of the car respectively. With a little ingenuity, one can incorporate a "stop-light" switch into the circuit so that the lamp will light when the lid is raised. To prevent frazzling and short circuit, use flexible stranded wire as a lead to the light in the lid.—Richard H. Brown.



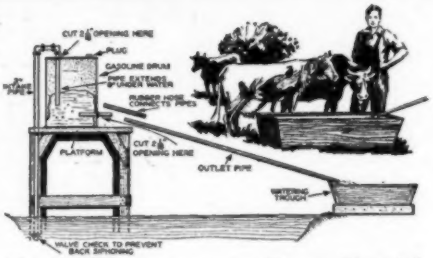
Storm Top for Auto Rumble Seat

IN CASE of a sudden storm, the fellow in the rumble seat gets a deplorable drenching. There's a way to prevent this disaster, however, and that's to rig up the demountable top shown in the accompanying drawing. A canvas curtain attached to the rear of the tonneau is unrolled to attach to eyelets on the end of a pair of uprights which are secured to fittings beside the rumble seat.—H. C. Thomas.

Labor-Saving Kinks for Handymen

Perpetual Siphon Keeps Trough Full

AN ABUNDANT supply of water will always be available when you erect this perpetual water siphon as illustrated in the drawing at the right. A steel gasoline drum is mounted on a platform and drilled with three holes at points shown to take the pipes. The intake pipe should extend down to within 6 inches of the bottom, and the outlet pipe should be at least four times as long as the intake pipe.—Robert Green.



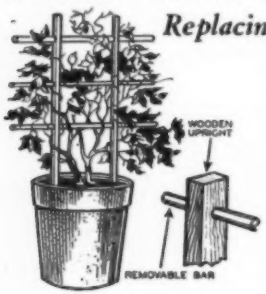
Read Inside House Temperatures From Outside

A THERMOMETER which shows the temperature of your hen house may be read from the outside, eliminating the necessity of opening the door, by bending the tube at an angle over a Bunsen burner and inserting it through the wall so that the upper half protrudes. The mercury bulb will thus be inside to register the temperature, while the section which indicates temperature is outside. Latter part should be calibrated.—Westy Doak.

Stocks on Collars Cure Dogs' Bad Dispositions

HIGH-SPIRITED dogs which have a way of getting excessively boisterous or engaging in a brawl at the slightest provocation, may have their activities curtailed by hanging to their collars a wood stock equipped with crosspieces. When these pins, shown in the drawing at the right, strike the front feet they hamper the dog's mobility to a considerable extent. A clip in the end secures the device to the collar.—Andrew Wight.

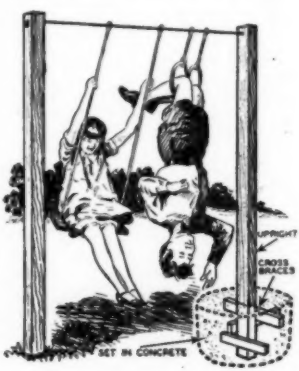
Replacing Decayed Flower Trellis



SUPPORTS for potted plants have a troublesome habit of decaying, making replacement necessary, which is often quite difficult owing to the tangling of the vines. This knock-down flower support, which is made of wood, as shown in the accompanying sketch, is just the thing when replacement becomes necessary. The posts may be driven into proper position, and the plants arranged to suit one's fancy. The removable bar, made preferably from a dowel, is slipped easily into position, since the bar is a sliding fit in the upright. Any number of bars may be employed. The branches should be tied in place to get them started again in right growing habits.—Louis Schneider.

Posts Strengthened by Crosspieces on Base

BEFORE setting posts upon which there is to be considerable tension or strain, it is advisable to strengthen the base in the manner shown in the accompanying drawing. Nail cleats at the bottom, and paint the part of the surface which is buried with hot tar to prevent rot. Set in concrete and about 18 inches deep, the posts will then be almost indestructible.—Hi Sibley.

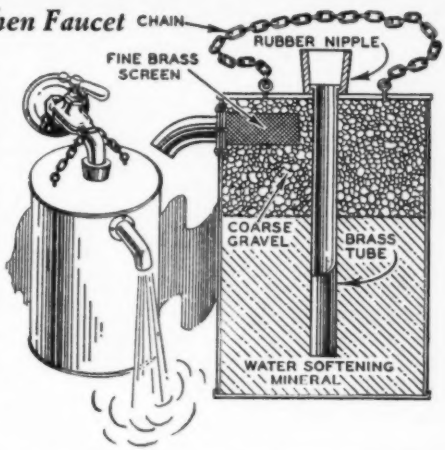


Catch Hens With Hook

IT'S no effort at all to snare a chicken with this little "catcher," which consists simply of a hook made from No. 9 wire and set in the end of a broomstick. Slip the hook over the leg.—Bill Bonson.

Novel Ideas for Home Convenience

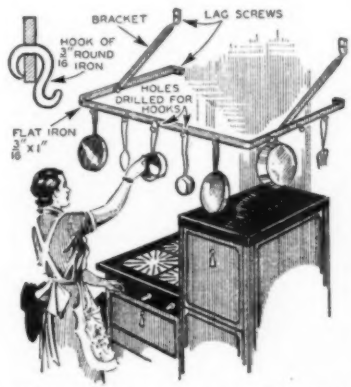
This Water Softener Works on Kitchen Faucet



FASTENED to any water faucet, this simple water softener will deliver more than fifty gallons of soft water before re-charging becomes necessary. The shell is a metal can 7 in. high and 4 in. in diameter, and made of nickeloid and soldered at the seams. The lower half of the can is filled with a water softening mineral, obtainable at any plumbing shop, while the upper half is filled with coarse, clean gravel. A fine brass screen fits over the outlet as shown in the accompanying drawing.

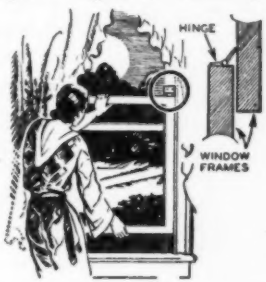
In recharging, empty the softener of all water, then fill it with a saturated solution of common rock salt. After a minute empty the device and rinse out the salt by running fresh water through it. It is then ready to soften another fifty gallons of water. A chain, attached as shown, holds the device to the faucet.—Kenneth Murray.

Handy Rack Above Stove for Pots and Pans



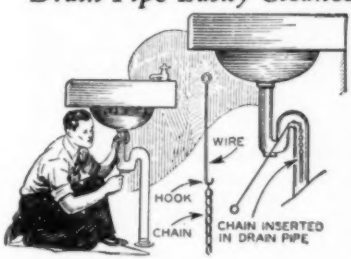
AN ADAPTATION of the racks used in hotel kitchens for cooking utensils can easily be made for home use from a length of flat iron about 3/16 in. by 1 in. This strip is bent to the shape shown and supported by two brackets of the same material. The bar is drilled for hooks to support the utensils. First locate studs (16 in. between centers in standard construction), then bend the bar to fit, so that studs will carry the lag screws. The best location for the rack is above the stove, where all the utensils will be within easy reach of the cook.—Abe Willson.

Hinge on Window Stops Burglars, Rattling



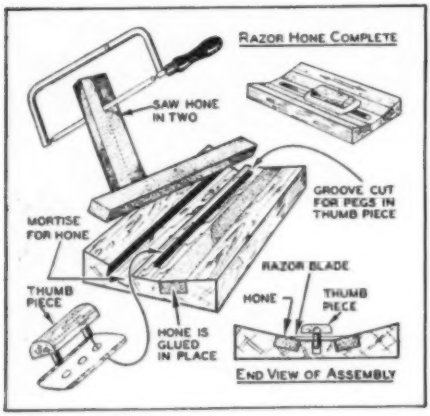
RATTLING windows have a way of making some frightful noises in the still hours of the night, and they are also susceptible to being raised, or jimmied up, by yeggs with thievish intentions. However, if a small hinge is fastened to the top of the lower window, as illustrated in the accompanying drawing, it will not only keep the windows silent, even when partly open, but it will also act as a brake to keep the frame firm against the persuasions of a crowbar. When not in use the hinge is folded back so that it lies flat on the top of the frame.—John Aunes.

Drain Pipe Easily Cleaned With Small Chain



HOUSEHOLD drains are constantly making a nuisance of themselves by becoming clogged from grease, strands of hair, etc., which cling to the inner walls of the pipe. It is hard to remove this material with a plain piece of wire, but if a short chain is added to the end, attached to a loop, much of the refuse can quickly be agitated loose. The chain, which should be fairly small, also easily adjusts itself to the sharp curves of an ordinary drain pipe. The pipe plug should be removed for better access to the curved section. In operation, thrust the wire into the pipe so that the chain follows, then work it in and out.—Wilson Mann.

Items of Interest to Workshop Fans

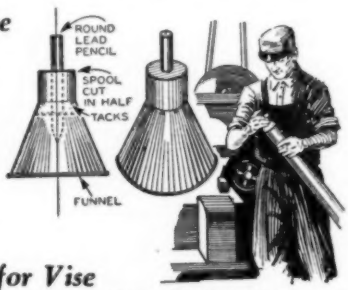


Sharpen Old Blades on This Hone

HERE'S the last word in sharpeners for safety razors. Constructing it is simply a matter of accurate workmanship. First off the reel cut out the baseboard, mortising it to take the hone as illustrated in the accompanying drawing. Note that these hones, cut in half, are set at a slight angle. Next, a groove is cut midway between these hones to act as slots for the sliding thumb piece. When doing your sharpening, insert the plugs of the thumbpiece in the blade, and set the plug in the groove. The rest is simply a matter of sliding the thumbpiece back and forth till the blade is sharp enough to suit you. It is a good idea to apply a little oil to the hone now and then to make the process run smoother. For a different type off the reel cut out the baseboard, mortis-thumbpiece.—Bob Poulson.

Simple Marker Aids to Center Work on Lathe

CENTERING a piece of wood before you place it on the lathe is easy with this simple device, which consists simply of an old funnel, an ordinary thread spool, and a pencil. These parts are assembled as illustrated in the accompanying drawing. The flange is cut off and the flare attached to the spool. The flare is placed down over the work and the center marked with the pencil. —Robert J. Phillips.

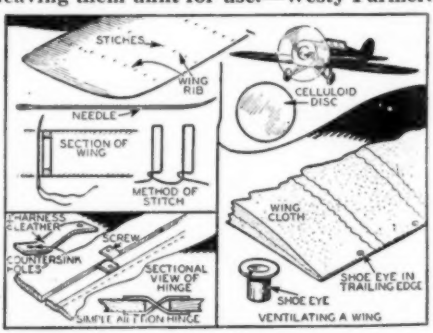


Finding Best Height for Vise

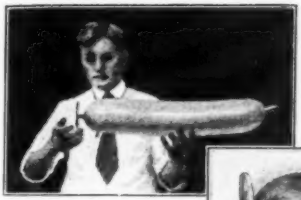
IF YOU are in doubt as to what is the right height for the vise, consult the drawing at the left and you will find the question settled. The top of the jaws should come just even with the tip of your elbow when your arm is bent up, as illustrated. That height will be found the most convenient for doing all kinds of jobs.—Arthur Mason.

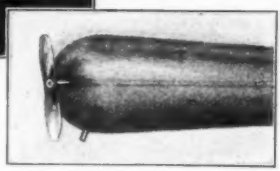
These Four Helpful Hints Will Assist You in Job of Building Plane

HERE are a few helpful ideas for builder of planes, model and otherwise. To make a convenient needle for stitching cloth to the wing, take a long piece of steel telephone ground wire, heat it, then flatten one end. Puncture a hole in the flat surface for an eye. The other end is also flattened, and ground to a long, thin point. With such a needle it's easy to find the other side of the rib when sewing. For hinges on ailerons, elevators, rudders, etc., use strips of harness leather, which should be about ⅛ in. thick and 2 in. wide. Criss-crossed, these strips give good flexibility. A celluloid disc, attached as illustrated in the accompanying drawing, will simulate a whirling propeller with striking realism on model planes on exhibit. To prevent sweating in a plane wing it's a good idea to ventilate the interior. Shoe eye grommets set on the trailing edge afford tight and safe ventilation. The fresh air prevents rot. In model planes where rubber bands are used as power, the bands should be left unwound when the plane is out of use. Never use oil on rubber bands, as it deteriorates the strands rapidly, leaving them unfit for use.—Westy Farmer.

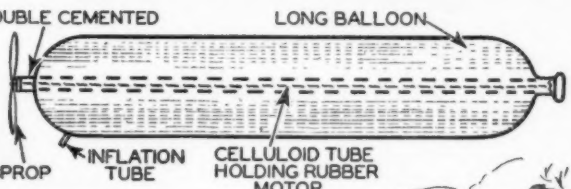


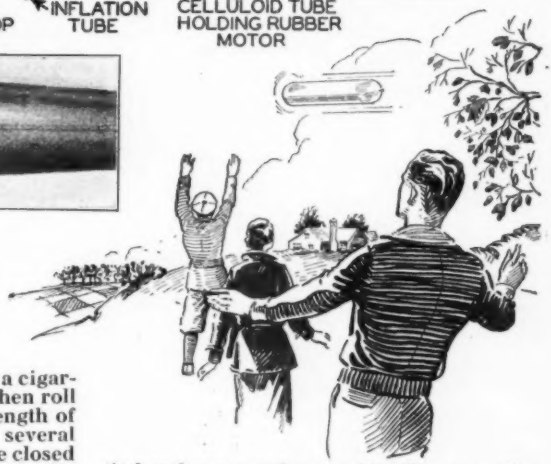
Jumbo Balloon Makes Model Zep





The motor is wound up by turning the propeller as shown above. The balloon is filled with gas through the small tube on bottom.



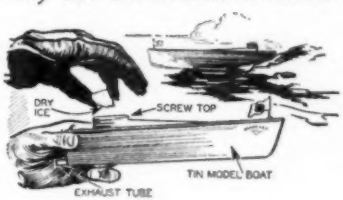


MODEL planes have received their due share of attention, so here is a new type of model, a dirigible, on which to experiment. Powered by a rubber motor, it will sail through the air three or four times as far as a model plane.

To make the dirigible, first secure a cigar-shaped balloon of the jumbo size. Then roll a sheet of celluloid, making it the length of the balloon, when expanded, and several layers thick. Make a small hole in the closed end of the balloon, slip the rubber over the end of the tube and tie it down carefully with a cord, fixing the joint with rubber cement.

The other end of the balloon must be stretched to the end of the tube and securely tied and cemented around it. The propeller is made of celluloid, reinforced with strips of the same material. The propeller is joined to a rubber band, which is in turn fixed securely to the other end of the tube. —Kenneth Murray.

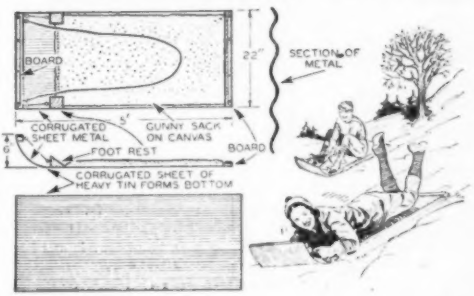
Dry Ice Furnishes Motive Power to Drive Model Boat at Speedy Clip



THE latest word in motive power for model boats is dry ice. When dropped in water a lump of this substance generates a gas which develops a considerable pressure when confined. A model boat with which dry ice is to be used should be made of tin, with only two openings, a screw top and a tube for exhaust. The boat is first filled with water, the top screwed on, and the hull is then placed in the water. The gas generated creates a thrust from the exhaust which drives the boat at a neat clip.—Will Davis.

Sturdy Toboggan for Winter Sports Made From Sheet of Galvanized Iron

STRANGE as it may seem, one of the finest materials for the making of a speedy and sturdy little toboggan is sheets of galvanized iron. A single sheet, bent on the end as illustrated in the accompanying drawing, will be plenty of material. Bracing is most essential. Note in the drawing that the braces consist of one cross-piece at the front and another at the rear. The former is further braced by means of two short lengths of wire, which are secured by screweyes. Gunny sack or canvas placed on the bottom forms a comfortable seat. The foot rest is a triangle-shaped block.—C. Duvale.



Bloodthirsty Creatures

The most ferocious denizen of the deep is the moray eel, which will deliberately attack a fisherman when landed in a boat. Insert shows the dental armament of the shark, consisting of six rows of razor edged teeth set in powerful jaws.

This enormous 2,200 pound leopard shark, caught in the Gulf of Mexico, tore great holes in fishermen's nets for a week before he himself became so enmeshed that he was unable to free himself. The episode ruined a $2,000 net.

Savage and deadly are the sea battles waged between fishermen and the bloodthirsty creatures which inhabit the deep. In this thrilling article, Mr. Wright, who speaks from long experience, describes the fighting methods of the shark, the barracuda and the fearsome moray eel, and tells of the great damage they inflict on fishing crews and their equipment.

NOT only in the jungle, but in the ocean depths as well, live formidable, bloodthirsty creatures which strike terror into the hearts of men. Fishermen who venture out beyond the bounds of safety, however, have all the resources of modern science to aid them, so that in their combats with the savage denizens of the deep they do not fight an uneven battle. Otherwise the casualties might make deep sea fishing impossible.

In the semi-tropical ocean waters of the world lives that savage fish, the barracuda, or barracouta, as it is known to Spanish-speaking people. It is known to have killed or injured many persons.

Barracuda Attacks With Diabolical Ferocity

This huge tiger of the sea, which sometimes reaches a weight of fifty pounds, is most widely known for its diabolical ferocity. It commonly reaches a length of four or five feet, but further south in the Caribbean has been known to reach eight feet and on the west coast of Africa, where it is more feared than the shark,

of the DEEP

by HAMILTON M. WRIGHT

Catching tiger sharks from small boats, as shown above, is most thrilling sport engaged in by California sportsmen. In insert is seen a devil fish, or giant ray, most feared of all marine inhabitants, which was caught in Gulf of California.

it becomes ten or twelve feet in length.

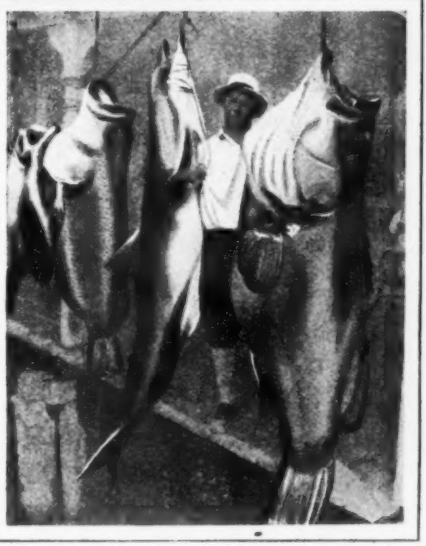
Insatiable curiosity, a ferocious attack, and a formidable dental armament mark this huge fish. Like a flash of lightning the great sea "pike" (as he is sometimes known) hurls himself through the water after a moving object.

His long inward-pointing canine teeth, overlapping and approximating a sausage mill, in a head which is about one-fourth the length of his body, chop like the fangs of a wolf. In a flash he may be gone. But in that savage, swirling onrush he may have bitten in two a fish two-thirds his own length.

Hazards of Deep-Sea Fishing

I once saw a four-foot barracuda devour half an eight-pound king fish. I had been trolling along Alligator Reef near Matecumbe Key, when a fine king fish struck and leaped high into the air. When, after a ten-minute battle, I had brought the "king" close to the launch, I saw another fish pass him like a flash of silver; almost like a gleam of light, so swift its motion seemed.

And I noticed the king fish was swimming queerly, his tail skewered to one side. "A barracuda," shouted someone. Again the monster slipped to the surface, and although I did see that the barracuda paused, yet it had bitten away one-half of the body of the king fish; bitten in two as cleanly as by the strokes of a meat cleaver.



Here is part of a five hours' catch in the gulf stream made by Ferd B. Nordman, Jr., of Daytona Beach, Fla. At the right is a 1000 lb. giant sea bass, next, an 850-lb. porpoise, and a smaller sea bass. A giant ox-ray is at extreme left.

The spinal cord of the king fish had been cut in two, clean. Its body, apparently, had been divided in two swift, chopping bites, an easy task for the barracuda, since its lower jaw projects be-

Ferocious Barracuda Attacks Fish Four and Five Times Its Own Length

The Sphyraena Barracuda, shown above, the largest and most vicious of the barracudas, and most savage game fish in the world, will attack fish four or five times its own length and often human beings. Note huge canine teeth.

This 1,900-lb. sawfish, caught in the Caribbean, put up a desperate fight for hours before it was finally landed. With his spiked snout, which he swishes from side to side when attacking, he is greatly feared by deep sea fishermen.

yond the upper, like that of a bull dog, and both jaws are provided with huge canine fangs.

The mouth is an enormous gape. Special breathing valves enable the fish to breathe without ejecting water through its mouth. In its swift rush after its prey it literally need never "stop to breathe." The long and powerful body, compressed and rounded, suggest the terrific speed of this greyhound of the water.

In general, the shape of the barracuda resembles that of the muskellunge, although the barracuda has a sharp-pointed snout. After several hours from the water the coloration of the barracuda suggests that of the muskellunge, but, when first taken the sea tiger is a lovely silvered hue, almost white, with quivering light metallic lustres that become darker within a few minutes.

The fish's teeth and mouth are infested with bacteria and inflict a nasty festering wound.

Moray Eel Most Vicious Killer

Of all the creatures of the sea there is no more vicious killer than a giant moray. He is the only creature of the deep that I know of which will deliberately attack a man after he has been landed in a boat.

Most of the so-called attacks by other deep sea creatures when out of their native element are usually discovered to have been accidents whereby an incauti-

Giant Moray Eel Deliberately Attacks Fisherman When Landed in Boat

A scene at a fishing camp in the Caribbean. It is here that the skinning, boiling and cooking of the sharks is done. Shark fins are sent to China, where they are considered a rare delicacy; cod liver oil is made from the liver.

ous spectator has been injured during the animal's death struggles, as when a man is hit by the lashing tail of a shark, or places his fingers too near a barracuda's teeth in extricating the hook.

But the moray eel is living death and he looks the part. He can inflict a fearful wound with his armament of razor-edged teeth. According to Dr. David Starr Jordan, a live moray, four to six feet long is often able to drive men out of a boat.

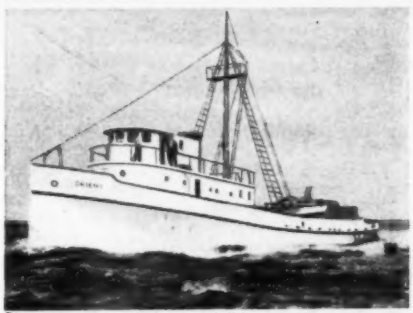
Moray Eel Terrorizes Fishermen

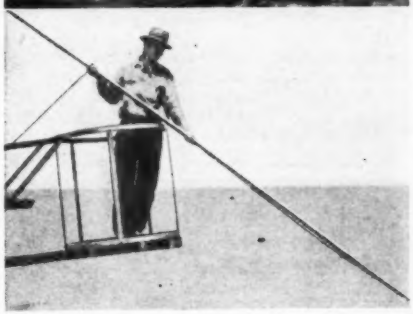
One day while fishing in deep tropical waters I caught a huge member of the moray eel family. It was longer than a man. Its body, at the middle, was as large as a man's thigh.

At first I thought I had my line snarled in the rocks at the bottom. Then I felt the line give, and pulled up a heavy load, for I was fishing with commercial fishermen with thick tackle. Up, up, I pulled over one hundred feet of line through the purplish waters above Gulf Stream reef. When through the greenish top water I saw what I had caught in the ocean's grab bag, I would have sworn it was an enormous python. The cruel eyes gleamed malevolently at the surface.

"Cut the line. Quick!" one of the fishermen shouted.

But too late! I had given a heave to my fish line as the boat started up on a great wave. I saw a bundle of dynamite in the





Top—The all-steel fishing boat, "Orient," built at a cost of $10,000. Below—Harpooner on "swinging pulpit."

form of a gigantic moray eel land on the foredeck. It made one flop seven feet up in air and in a second was between the fish well in the middle of the foredeck

(Continued on page 188)

This Portable Electric Robot Diagnoses Motor Troubles

C. C. Anderson, San Francisco electrician, is shown here with his electrical robot which locates motor troubles. A system of dials is arranged in the form of a face.

THE "robot" electrical tester constructed out of spare shop parts by C. C. Anderson, an electrician of San Francisco, California, tests spark plugs, coil, distributor points, ignition wires, valve timing, carburetor adjustment, generator charge and vacuum tank action.

A dial constructed in the left eye of the robot registers voltage, while the one in the right eye measures amperage. The valve testing apparatus is located in the nose. Neon tubes placed in the mouth, giving the appearance of teeth, register spark plug gap adjustments.

The mechanism can be moved to any part of the shop to conduct a motor test.

No Excuse for Missing Button!

ALL of us, old or young, and especially us bachelors who send our laundry to the Chinaman on the corner, have difficulty at times when attempting to thread needles.

You will be surprised at the ease at which the thread goes through the needle's eye if you hold a white card beneath it.

Holding a white paper under the needle aids marksmanship.

Bang Goes Another Illusion!

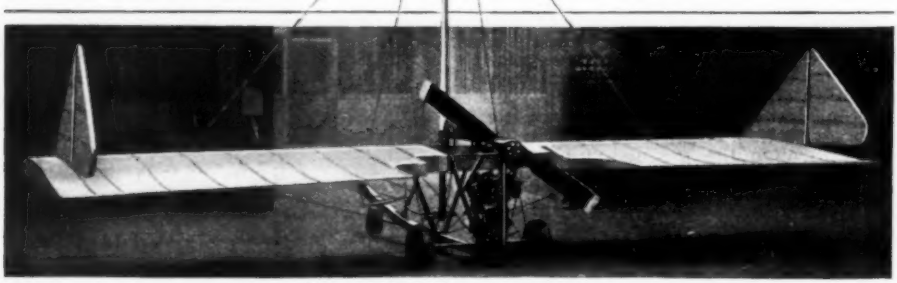
ONE of the commonest mistakes about astronomical telescopes is to think that they are intended to magnify the planets and thus to make them appear closer to the earth. The truth is that even a very small telescope may be given just as great magnifying power as a giant instrument.

The real duty of a large telescope is to gather more light so that the images of heavenly bodies will be brighter. Stars as faint as about the sixth magnitude are visible to a person with keen eyes. Stars fainter than this are invisible except through telescopes, not because magnification is needed but because not enough light can get through the hole at the front of eye.

Novel Kite Flying Machine

A QUEER flying machine, possessing some of the characteristics of a flying wing trying to fly a kite, has just been completed by Vicomte Charles de Rouge at his workshop in Neuilly, France.

The contraption has been named the "Electroplan Sisma," which seems to be about as good a name as any. Our dispatch fails to state if it flew.



Here's a full view of the "Electroplan Sisma" designed by Vicomte Charles de Rouge. That is the stabilizer on top.

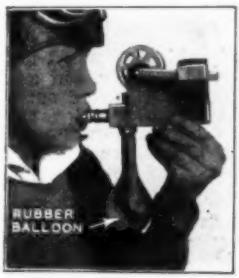
Bicycle Convertible for Water Travel on Inflated Pontoons

COLLAPSIBLE pontoons which can be inflated at will to convert a land bicycle into a sea-going craft have been designed by a German cyclist who does a lot of cross-country traveling and who doesn't want to be balked by unbridged rivers or lakes.

As shown in the photo at the right, the pontoons, of fabric construction, are rolled up and fitted compactly to a framework on the rear of the bicycle. The pieces of this framework, when fitted in place underneath the bicycle, support the pontoons. A driving propeller is geared up to the rear wheel of the bike to furnish motive power.

Collapsed pontoons, mounted on rear of bicycle, are shown in top photo. Note how propeller is geared to rear wheel, ready for action when lowered into the water. Bottom picture shows pontoons inflated and bicycle traveling on water.

Toy Driven by Balloon Power

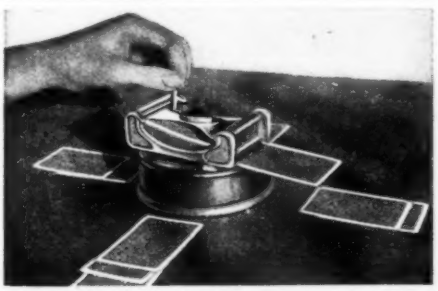


Inflating the rubber balloon as shown above supplies pressure to drive this midget toy motor.

DRIVEN by air pressure from an ordinary toy balloon, the midget air engine shown at the left runs at great speed when the balloon has been inflated. The toy is made of wood and cardboard, with a turbine of cardboard which turns the flywheel. One filling of air will run toy for half minute.

Mechanical Bridge Dealer

ONLY seven seconds are required to deal a round of bridge hands with the device shown in the photo below. A shuffled deck of cards is dropped into the top and a knob is turned to do the dealing. Each rotation of the deck passes out four cards to the players, and an adjustable heart-shaped weight determines whether the cards shall be dealt near the device or flung to the edge of the card table immediately in front of each player.



Turning the knob on the top as shown in the photo, this device deals out four bridge hands in seven seconds. The distance to which cards are thrown can be regulated.

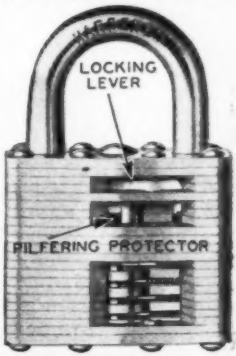
Tin Cans Best for Flowers

OLD tin cans are better containers for growing plants than the usual clay pots, it has been discovered. Tin cans are superior because they are not porous and produce a more even distribution of water through the soil contained in them. Clay flower pots are likely to absorb too much of the water poured into them, leaving the lower plant roots in bone dry soil.

The fact that water does not drain out of tin cans makes it advisable to water plants in such containers less frequently.

Padlock Built Like Bank Vault

TAKING a hint from the laminated construction used in bank vaults, a manufacturer has brought out a padlock built along the same lines which is said to be stronger than a solid block of steel. It has the strength of a bank vault door in miniature, being constructed out of steel plates riveted together at tremendous pressure. The lock is plated to prevent rust.



Laminated steel plates, riveted together, give this padlock the rigidity and strength of construction of a bank vault door.

Plans for the Pietenpol

Since plans for the Pietenpol Air Camper were published just a year ago, several hundred sets of blueprints have been purchased, and those who followed the plans closely were, without exception, successful in building a safe and economical airplane. Owing to the insistent demand of light plane fans for a similar ship powered with a Model T motor, the originator of the Air Camper has designed the Pietenpol Sky Scout especially for Modern Mechanics and Inventions' readers.

Part I

NO SOONER had my article on building the Air Camper appeared in MODERN MECHANICS AND INVENTIONS than the readers began flooding both myself and Andy with queries as to whether the ship could be powered with a Model T motor.

Unfortunately I had to tell the fans that the Model T was hardly powerful enough for a two-place job. And then the fun began! Letters started pouring in, asking for plans for a one-place job that could use the main-spring of an old Henry. Well, here we are!

But before going into the actual construction of the Sky Scout I wish to say a few things about the ship, how it happened to be, what it will do, and what not to expect of it.

Back to the Model T

I have been experimenting and building light planes since 1920 and my first ship was a biplane powered with a Model T Ford motor. The ship was very light, but not very strong, compared with the Sky Scout. However, I did with that first plane what a lot of you who build *your* first ship will try to do. I mean teach yourself to fly.

The plane was fully able to fly as I had it in the air about twenty times, but as I didn't know how to land, I busted something every time I had it up.

The last time I tried it in a 25-mile wind and there was not enough left of the crate to fix it up after that.

Learn to Fly First

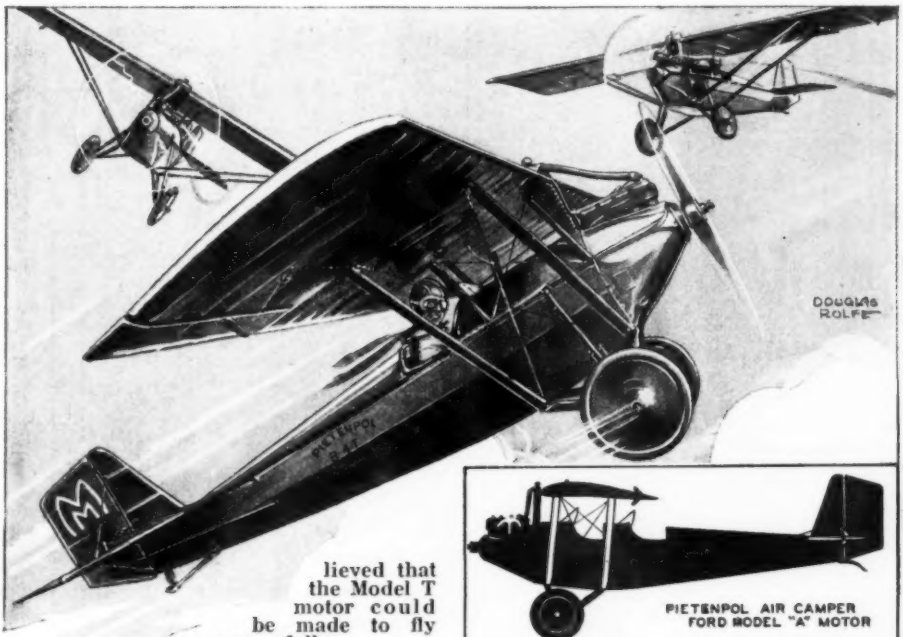
So my first bit of advice is, by all means learn to fly before you try to take your own ship into the air. While I started flying with not over four hours and twelve landings, and soloed and test flew a ship at the same time, I sure advise you against that method. But where could you find a school in 1920?

I then went in for higher powered jobs, but always be-

The Pietenpol Sky Scout taking off from the Wold-Chamberlain airport at Minneapolis, Minn., for a cross-country hop.

SKY SCOUT

by **B. H. PIETENPOL**
Designer of the Pietenpol Air Camper



The Air Camper and Sky Scout compared. The same sturdy construction is evident in every line of the Scout as was found in its bigger and higher-powered brother.

lieved that the Model T motor could be made to fly successfully.

About in 1928 when the new Ford came out I decided that the Model A was the engine I wanted, so I bought all the sample parts from the Ford dealer and assembled a motor, although I had not seen the inside of the new Ford. The ship flew and was a success from the start.

Model A Gets All Credit

There was only one thing I did not like about this—the motor got all the credit, and the ship got none. So when the editors of M. M. told me that they could use a similar ship that would fly good on a Model T motor, I built the Sky Scout to prove to myself that I could build a ship powered with that motor which would be practical, and also to prove that the Model A engine was not the only automobile motor that would fly successfully.

The Model A is a wonderful motor for the small plane, and may be used in this ship, and advise its use if you have not a Model T all rebuilt for aircraft use. There must be hundreds of them built up.

The only change needed if the Model A motor is used is to move the wing about one inch ahead and put on a little larger radiator, as the ship is plenty strong for this engine, and cowling and all will fit.

Now a few words on what the Sky Scout is:

First, the ship was designed to be as easy to fly as it is possible to make it. I have never flown a plane that handled better. It is also almost impossible to hurt it landing.

I have watched two fellows make their first solo on this ship, and if ever a plane had a reason to crack up, it did when it landed about 20 feet up and pancaked down.

I have watched students fly into the ground with the tail skid two feet in the air, and have also watched the tail skid strike the ground when the wheels were two feet in the air on a stall landing.

The ship now has about 100 hours of this sort of time. The only thing that has been hurt is one vee on the landing gear that was bent a little on a forced landing made down wind when one wheel went

Below Are Complete Profile and Propeller Elevation Plans of the Scout

THE WING SPAN OVERALL IS 27 FT 3 IN (327")
PULLEY AND HORN
PULLEY
42"
#12 GAGE
73½"
3/32" CONTROL CABLE TO AILERON
NOTE: THE CENTER STRUTS LEAN BACK FIVE-ONE HALF INCHES BRACE CABLES ON SIDES AND SIDES ONLY
RADIATOR
STREAMLINED FLYING STRUTS SEE DETAILS
AILERON HORN
AIR SPEED INDICATOR
ALTIMETER
TACHOMETER
22"
1" X 7/8" NOTCH FOR LONGERONS
TEMPERATURE GAGE
PUSH PULL THROTTLE
SWITCH
BANKING INDICATOR
OIL PRES. GA.
THE COMPLETE ARRANGEMENT OF INSTRUMENTS ON DASH BOARD
1" BOLT
DIA
DETAIL OF AXLE COLLAR
THE FRONT VIEW OF THE PLANE
26" X 3" WHEELS AND TIRES
20"
NOTE: COVER THE FUSELAGE WITH GRADE "A" AERO COTTON MAY BE TACKED TO FUSE. GIVE 5-COATS OF DOPE
GROUND LINE
GAS FILLER CAP
56" TREAD
77"
60" CHORD
22"
NOTE: TO CUT DOWN FRONTAL AREA, CUT FULL SIZE RADIATOR IN HALF AND LAP ONE HALF IN BEHIND THE OTHER
WATER HOSE
72" DIA WOOD PROPELLER 42" PITCH
FORD MODEL "T" OR "A" MOTOR
STREAMLINE THE COWLING WITH 22 GA. ALUMINUM
SEE DETAILS OF LANDING GEAR ASSBLY
AILERON HORN AND 3/32" CONTROL CABLES
WINDSHIELD
HEAVY PADDING AROUND COCKPIT EDGES
FUEL LINE
3/32" CONTROL CABLE
SHOCK STRUT
FLYING STRUT BRACE CABLES ARE 3/32" STRAND
26" X 3" WHEELS AND TIRES
1/8" BRACE CABLE OR #14 GA. HARD WIRE
1" X 1/4" SPRUCE TURTLE BACK RIBS
1" X 1/4" SPRUCE FAIRING
3/32" CONTROL CABLES
THE SIDE VIEW OF THE COMPLETE PLANE
SEE THE ASSEMBLY OF THE TAIL SKID
RUDDER
HORN
37"
ELEVATOR
FRONT STABILIZER BEAM
1" X 18 GAGE ATTACH FITTINGS
UPRIGHT FIN BEAM
1/8" RIVET
SCREWS
LONGERONS
1/8" BRAZE BOLTS
DETAILS OF ATTACHING HORIZONTAL STABILIZER AT FRONT BEAM TO LONGERON
THE GROUND LINE
30"
140½"
OVERALL LENGTH OF PLANE IS 18 FT. 3 IN.
16½"
THE SCALE
0 IN INCHES 48
NOTE: SEE FUSELAGE DRAWINGS FOR THE COMPLETE DIMENSIONS

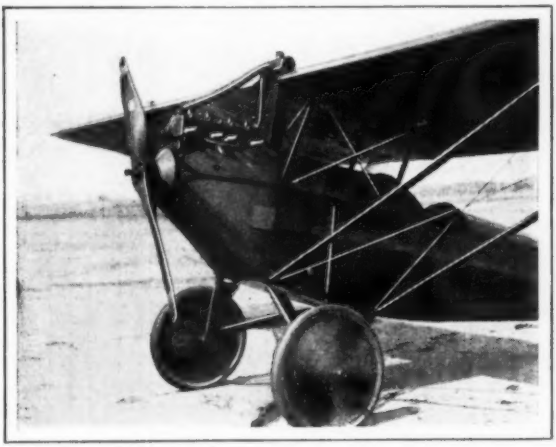
Outboard and front elevations of the Sky Scout. Details of the instrument board, axle collar, and horizontal stabilizer.

into a sharp ditch (it did not nose over).

I also saw this ship land on a plowed field O. K., although it was necessary to pull it on to a solid field to take off as it could not move an inch on its own power—the field was too soft.

Now do not think I advise you to do these things as I certainly do not. But it's comforting to know that your plane can stand this kind of abuse without cracking up.

The Sky Scout has a climb of at least 200 feet per minute, although it has been climbed at around 500 several times. It has a top speed of about 62 miles per hour, a landing speed of under 35 miles per hour, a take-off run of 150 feet on a good field, and about 250 feet landing run.



This excellent view shows the installation of the Ford Model T engine in the Sky Scout. Note location of the radiator and individual exhaust stacks.

We let the motor turn a six-foot propeller with a 42-inch pitch, 1740 maximum revolutions per minute on the ground, and cruise the motor at between 1500 and 1600 in the air. The throttle is about one-third open at cruising speed so you see you have some reserve power. The motor will turn as high as 1800 in the air.

Blueprints Correct

The editors showed me a set of blueprints that they made from the shop drawings that I used in building the ship, and let me say for the plans that they are exactly like this plane is built, and the most beautifully drawn up and easy to understand that I have ever seen.

There are a lot of improvements in these prints that will also be a great help to you if you are building the Air Camper.

Again I wish to say that these plans are exactly as the ship was built, and if we build any more of this model, they will be exactly like this one, as after flying the whole season of 1931 we have not found one improvement we would wish to make, and the plane is far better than we dared hope for.

So please do not write to have the design changed, as I advise that the ship be built as it is.

There are so much of the instructions printed right on the plans that it does not seem necessary to write a treatise on how to build it, but I will try to give a few pointers that will be of help to you.

Designed for Easy Building

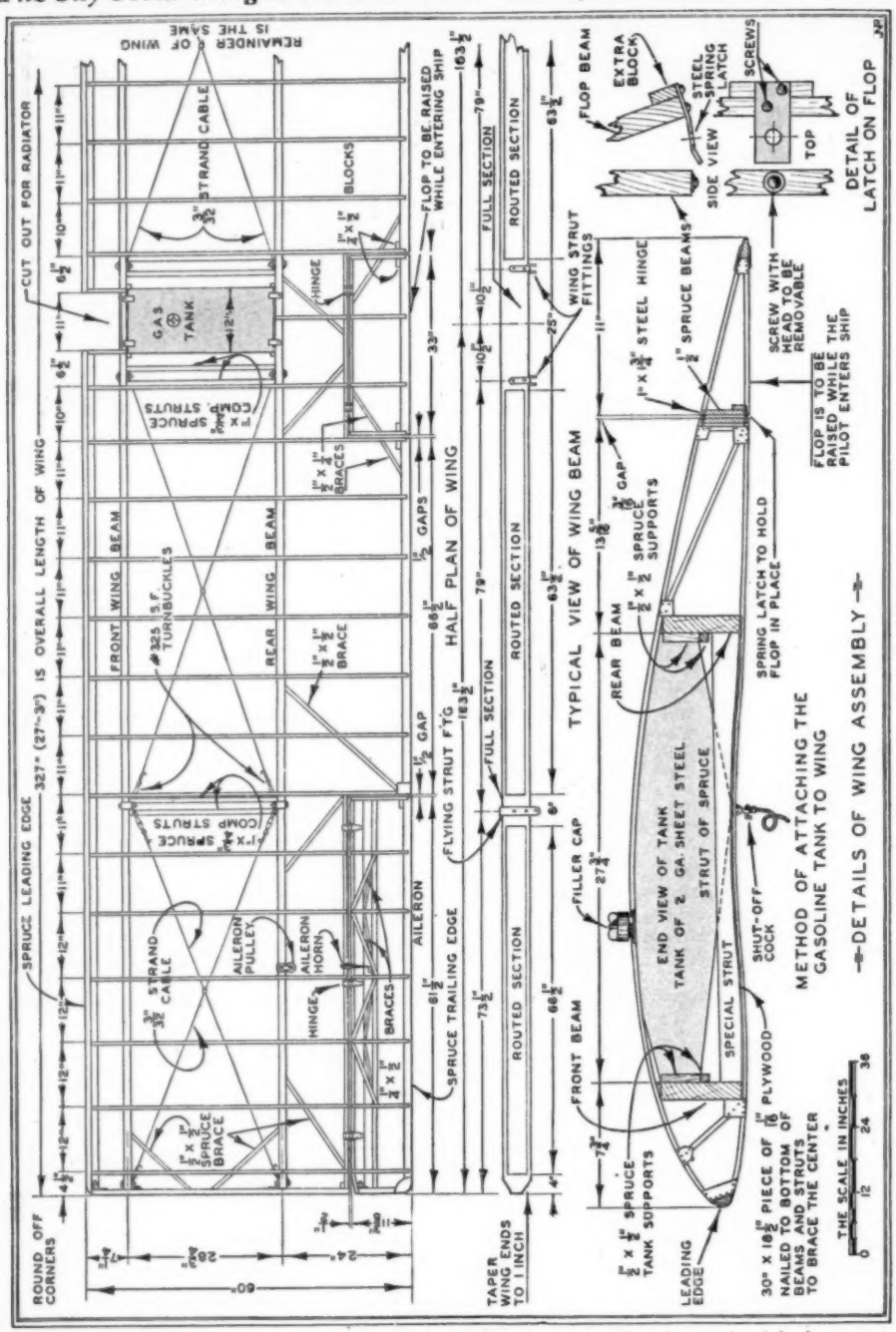
The Sky Scout was designed to be as easy as possible to build; but unless you know you are capable of building a plane, or have someone to help you that is capable, please do not try to build any airplane.

I believe this is the easiest ship to build

Specifications of the Pietenpol Sky Scout

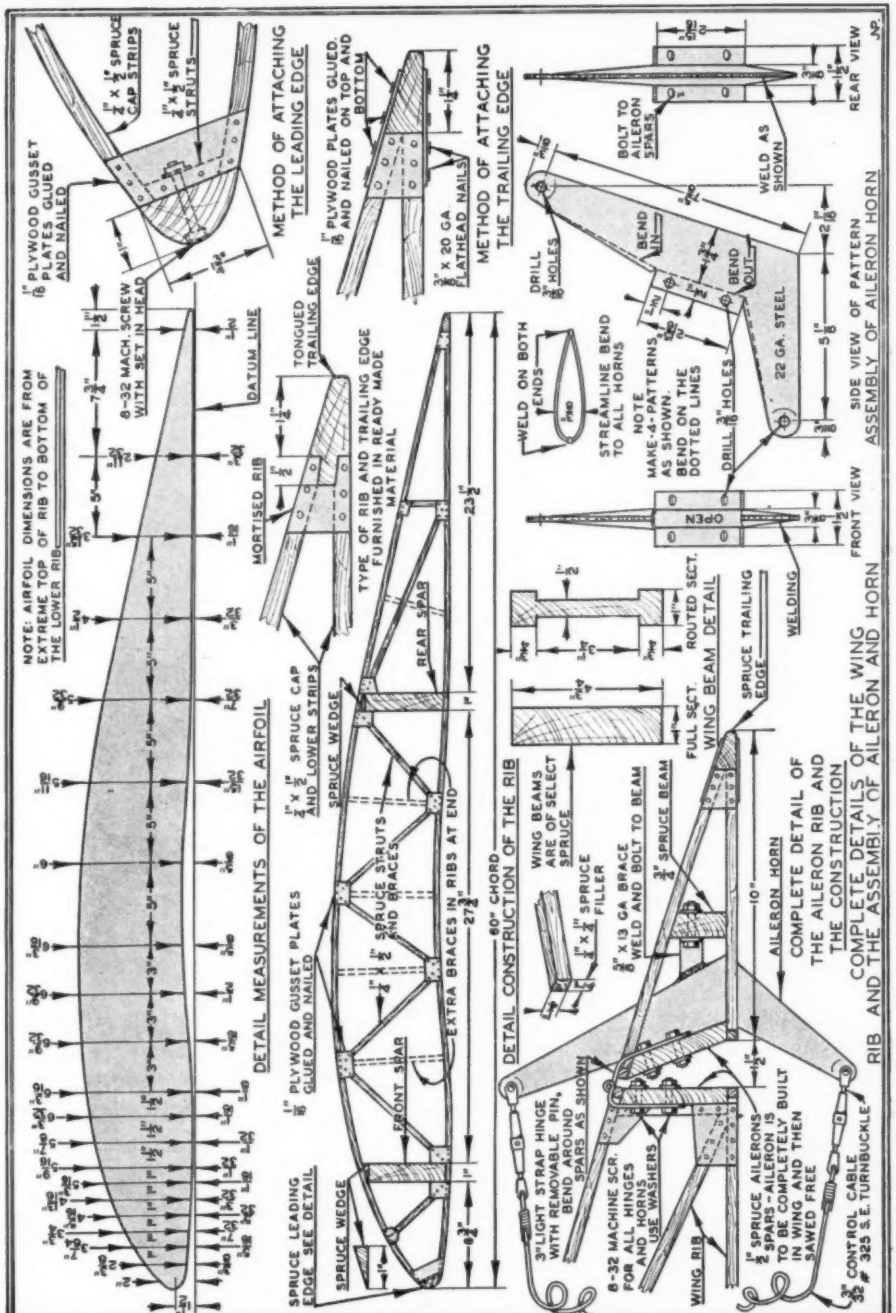
High Speed	62 m.p.h.
Cruising Speed	55 m.p.h.
Landing Speed	35 m.p.h.
Take-off Run	150 feet
Landing Run	250 feet
Initial Climb	Minimum, 200 ft. per min.
Span	27 ft. 3 in.
Chord	5 ft.
Length	16 ft. 3 in.

The Sky Scout Wing Is Identical With That of the Pietenpol Camper



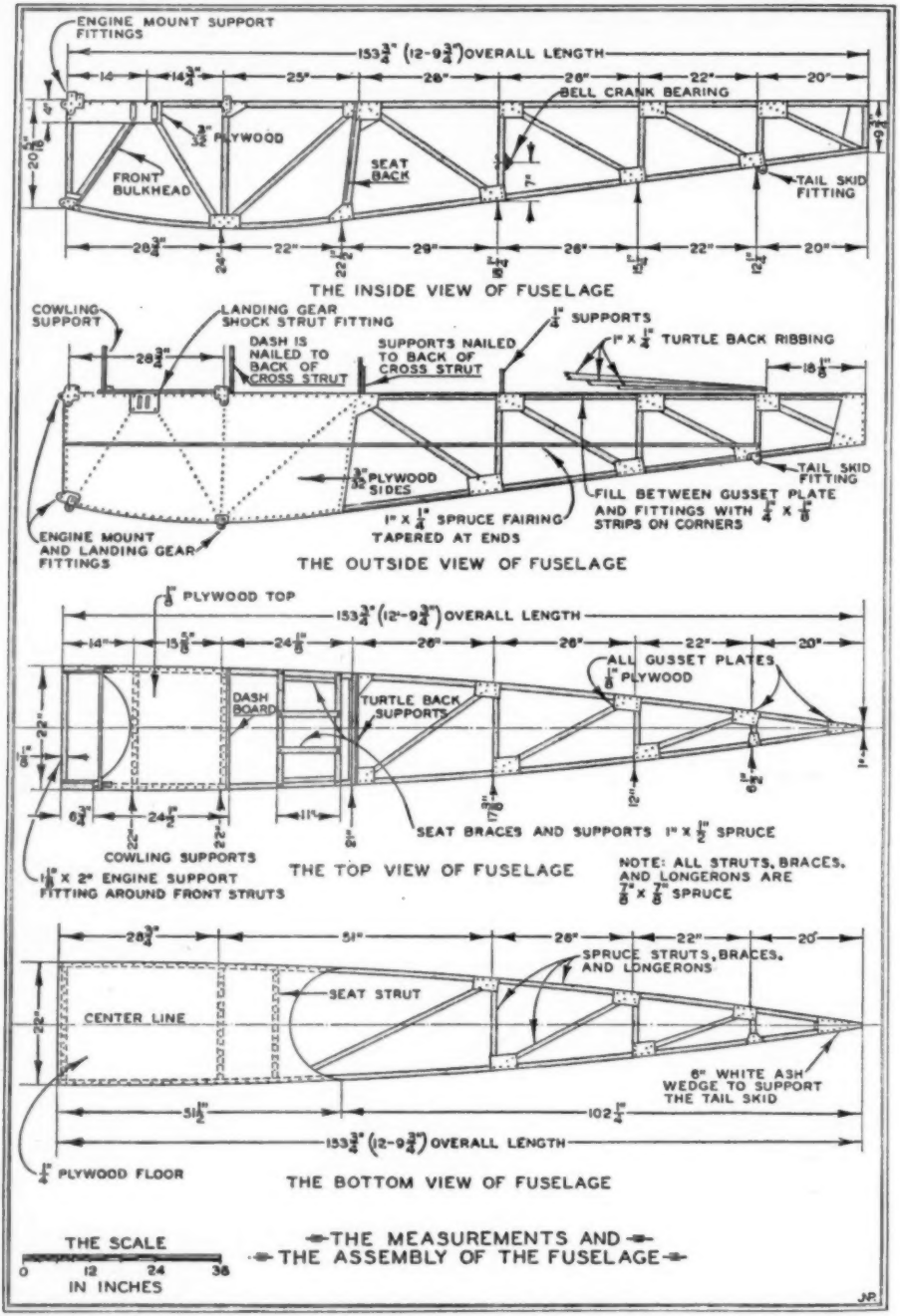
Details of wing assembly are given on this working drawing. The method of installing sheet steel tank in the center section of wing is clearly shown here. Another interesting innovation is the flap at the trailing edge of the center section.

The Special Wing Rib Was Developed for Sturdiness and Quick Climb


DETAIL MEASUREMENTS OF THE AIRFOIL
NOTE: AIRFOIL DIMENSIONS ARE FROM EXTREME TOP OF RIB TO BOTTOM OF THE LOWER RIB
DATUM LINE
1" PLYWOOD GUSSET PLATES GLUED AND NAILED
1" x 1" SPRUCE CAP STRIPS
1" x 1" SPRUCE STRUTS
8-32 MACH. SCREW WITH SET IN HEAD
METHOD OF ATTACHING THE LEADING EDGE
1" PLYWOOD PLATES GLUED AND NAILED ON TOP AND BOTTOM
3" x 20 GA FLATHEAD NAILS
METHOD OF ATTACHING THE TRAILING EDGE
TONGUED TRAILING EDGE
MORTISED RIB
TYPE OF RIB AND TRAILING EDGE FURNISHED IN READY MADE MATERIAL
1" PLYWOOD GUSSET PLATES GLUED AND NAILED
1" x 1" SPRUCE CAP AND LOWER STRIPS
SPRUCE WEDGE
REAR SPAR
SPRUCE STRUTS AND BRACES
EXTRA BRACES IN RIBS AT END
60" CHORD
23½"
27¾"
SPRUCE LEADING EDGE SEE DETAIL
FRONT SPAR
DETAIL CONSTRUCTION OF THE RIB
WING BEAMS ARE OF SELECT SPRUCE
1" x ½" SPRUCE FILLER
⅜" x 13 GA BRACE WELD AND BOLT TO BEAM
¾" SPRUCE BEAM
FULL SECT.
ROUTED SECT.
WING BEAM DETAIL
SPRUCE TRAILING EDGE
WELDING
AILERON HORN
10"
COMPLETE DETAIL OF THE AILERON RIB AND THE CONSTRUCTION
3" LIGHT STRAP HINGE WITH REMOVABLE PIN, BEND AROUND SPARS AS SHOWN
8-32 MACHINE SCR. FOR ALL HINGES AND HORNS USE WASHERS
WING RIB
1" SPRUCE AILERONS SPARS. AILERON IS TO BE COMPLETELY BUILT IN WING AND THEN SAWED FREE
CONTROL CABLE 3/32" 325 S.E. TURNBUCKLE
COMPLETE DETAILS OF THE WING RIB AND THE ASSEMBLY OF AILERON AND HORN
WELD ON BOTH ENDS
STREAMLINE BEND TO ALL HORNS
NOTE MAKE 4 PATTERNS AS SHOWN. BEND ON THE DOTTED LINES
DRILL ⅜" HOLES
22 GA. STEEL
OPEN
FRONT VIEW
DRILL ⅜" HOLES
BEND IN
BEND OUT
BOLT TO AILERON SPARS
WELD AS SHOWN
SIDE VIEW OF PATTERN
REAR VIEW
ASSEMBLY OF AILERON HORN

Details of the wing rib construction. The airfoil shown here is original with the designer, and is exactly the same as that of the Model A Air Camper. Construction is a trifle heavy, but the ship has been designed for safety rather than speed.

Simple, Easy to Build Wooden Fuselage Follows Time Tried Principles



Dimensioned drawings of the Sky Scout wooden fuselage. It has been the experience of the designer that de Havilland type of wood construction is simpler to build and will stand up under the hardest usage. This job is a marvel of strength.

there is. However, I wish to have only safely-built and good flying planes in the air, and if I knew that any unsafe ships were built from these plans I would prefer that you had never seen them.

I believe that this is the safest plane for the beginner that has ever been built. It is for the fellow that is going to build his own ship that these plans were made. All of us who are interested in aviation have to make a start some time and I think that building your own light plane is the best way to get started.

The Fuselage

We will now take up the construction of the fuselage. This is very plainly drawn up and I do not think you will have any trouble with it. It is made from ⅞"x⅞" Spruce, for longerons and struts, while the sides and front are covered with 3/32" mahogany plywood. The floor is made of ¼" 5-ply haskelite. All gusset plates of ⅛" material. Remember, all plywood must be regular aircraft grade and waterproof.

Use a good glue. We use Rodgers semi-waterproof and give it two good coats of varnish. You may use regular casein glue, but be sure you know how to handle it. It won't keep long (twelve hours).

Make Jig for Fuselage

You will need a large bench on which to draw out and build your jig. We use the same jig for both sides.

Each strut is held in place by blocks which are left nailed down until both sides are finished. Also leave the longerons a little long, and wrap some wire from the top to bottom longerons, twisting it tight with a nail until you have the plywood nailed and glued on each side. When the glue is dry you may saw off the longerons in front.

First lay out one side in the jig, putting in all struts and braces. When you make one strut, make another just like it to be used on the other side so the two will be exactly alike. Be sure to use a miter box for this work.

Next glue and nail on all the ⅛" gusset plates, wire the front longerons together so they will not spring apart and break the gusset plates.

Don Finke demonstrates the utility of the flap, which is necessary for easy entrance and egress. Photo also gives you an idea of the plane's visibility.

Now remove the side from jig, pat the longerons, struts, and braces for the other side into the jig, and put the gusset plates, starting from tail and working up to where the 3/32" sides start.

Now take the side you have just finished from jig, lay it in on a piece of 3/32" plywood, and mark out all longerons, struts, and braces by running a pencil around them, then cut the plywood the size of fuselage. Make two of these—one for the right and one for the left side.

The side of the plywood bearing the pencil marks goes on the outside, and gives you good marks to keep your nails between.

Glue and Nail Gusset Plates

Now put a good layer of glue on longerons, struts, and braces as far back as the plywood goes; lay on your plywood and get busy nailing it down with ¾"x18 gauge cement coated nails. All other gusset plates are also put with this size nail.

When you have this done, wire front of longerons together and remove from jig. Now remove all blocks from the bench so that it is smooth. Turn the side of the fuselage over and put gusset on that side;

(Continued on page 176)

Blueprints for the Pietenpol Sky Scout

A complete set of large size shop blueprints of the Pietenpol Sky Scout may be obtained for $4.00, postpaid, from Modern Mechanics and Inventions, 529 So. Seventh Street, Minneapolis, Minn. Blueprints are not sent C. O. D., nor on approval.

Music Sheet Has Radium Notes for Television Artists

Luminous manuscript for television artists has the characters written with radium paint on black paper, making the music visible to performers in darkness of studio.

TELEVISION performers, working in almost complete darkness, except for the flying spot, have found difficulty in reading music when they were broadcasting a program. To remedy this difficulty and enable the performers to see better the music manuscripts from which they are singing, Elliott Jaffee, a New York recording artist, has devised a luminous manuscript on which the characters are painted on black paper with radium paint.

This invention eliminates one of the greatest difficulties the performers have encountered. Now, however, the music is as plain in the darkness as the figures on a radium watch.

No More Wrinkles in Prunes

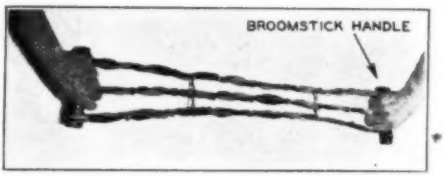
THE prune, long famous for its corrugated complexion, is to have itself beautified by means of a new picking device which has recently been put to use in California.

This new machine, which bears a striking resemblance to an enlarged lawn mower, has a cylinder studded with sharp spikes whose function is to roll over the ground and impale the prune-plums lying around, waiting to be harvested.

Plum prunes thus impaled are brought around to the top of the cylinder where they are removed by a set of grooves, as illustrated below. Customary handling of the prune plum is avoided during the picking process, so that wrinkling is prevented.

Spikes on the cylinder impale prune-plums on ground and place them in a chute as shown in the photograph above. Untouched by hands, the prunes develop no wrinkles.

Exerciser From Old Inner Tube

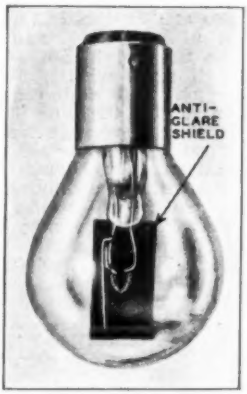


To make chest developer, rubber bands are attached to the handles cut from old broom stick. Four strands are ample.

TO MAKE a chest developer and muscle exerciser from an old auto tube, cut rubber bands from the tube ⅝ or ¾ inch in width and loop them together to form strands. The handles are cut from an old broom stick, and the end bands are double looped over the handles, as shown in the photo above.

Auto Lamp as Anti-Glare Shield

MOTORISTS will welcome a new anti-glare lamp which greatly reduces the dangers of driving at night. The internal glare reducing device on this lamp consists of a special metal shield on the bottom side of the filament which prevents the light from striking the lower part of the reflector. Another feature of the bulb is that its rays penetrate fog. The chief advantage, however, is that direct rays of light from the filament do not blind the eyes of the motorist of the oncoming car.



Glare shield under filament prevents the blinding of motorists.

Glass-Enclosed Orrery Shows All Movements of Planets

A NEW orrery, or astronomical clock, distinctive chiefly because of the fact that it is encased entirely in a great glass globe five feet in diameter, was placed on exhibition at the Franklin Institute, in Philadelphia, recently.

Made by Michael Sendtner, of Munich, Germany, the orrery is also unique in the fact that it not only shows the relation of the planets to each other and their movements around the sun, but also shows them in relation to the whole solar system.

The miniature heavenly bodies are manipulated by a finely scaled mechanism with a central shaft on which other shafts cause heavenly bodies, shown in their relation to the sun, to make complete periodic revolutions around their orbits. On the globular glass case the stars are displayed in their fixed positions.

Completely enclosed in glass globe, on which the stars and constellations are displayed in their fixed positions, this new Sendtner orrery shows relationships of heavenly bodies.

Lamp Shade in Football Motif

Shade of this unique light is made from parchment and shaped like helmet while base and upright are cast in metal in form of football. Complete lamp is done in school colors.

SOMETHING distinctly unique in the way of desk lamps was introduced at a University of Southern California sorority house. The shade was cut from parchment and made to resemble a football helmet, while the upright, cast in metal, forms a football. The lamp attracted wide attention and gave a sportive air to the room which it decorated.

Drug Said to Cause Clairvoyance

A SOUTH AMERICAN plant called Yage is believed by natives to have the magical property of enabling the drinker to see great distances or through obstacles. Before the drinker falls asleep everything seems to be filled with hazy bluish rings. As the stupor deepens the sleeper sees vivid visions of things or people known to be somewhere else. This is the reason the drug is supposed to cause clairvoyance.

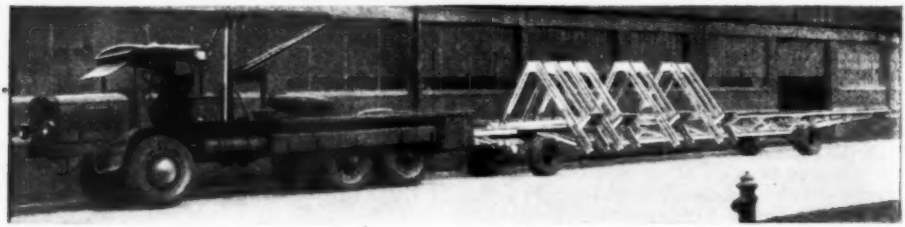
This Surf Board Can't Get Away

A NEW type surf board which cannot get away from the swimmer even if she should let go with the hands, has been recently introduced at Pacific coast bathing beaches. What secures the board is a cut-away section in the rear for the legs of the swimmer, thus permitting her to rest in a natural swimming position.

The board also proves an aid for students of swimming.

With legs fitted in cut-away sections of this surf board, there is no danger of its getting away.

Airplane Wrecking Truck Carries Derrick Equipment



The six balloon-tired wheels on this airplane wrecking truck enable it to travel over plowed fields without getting stuck. Airplane wings are accommodated on the angular framework of the trailer, with a flat space behind for fuselages.

WRECKED airplanes are difficult to handle at best, and when the wreckage lies in a field off the highway, as it usually does, the job of transporting it back to the hangars for repair requires the services of several men and two or three trucks. The average airplane fuselage is too long for an ordinary truck to carry, and the job of lifting heavy parts calls for considerable man power.

A special truck devised for the Army, however, simplifies the job by providing a derrick as part of the truck's equipment, making it easy to lift engines and heavy steel parts to the truck floor. A trailer is provided with angular framework to carry wings, and a flat space to accommodate fuselages and flat parts.

Advertising Stunt Makes Money

In this new advertising medium, space on the walls of the room is sold to advertisers who post messages there and are brought in touch with patrons of the place.

A YOUNG man in Los Angeles has originated a clever idea in advertising that seems destined to greatly affect some of the present day systems, since it is making a handsome profit for its sponsor and patrons.

This enterprising fellow rented a store in the business section of the city, and fixed up the walls with blackboard and sections so that the place resembles something between a stock broker's quotation board room, a street car advertising rack, and a gigantic newspaper advertising section.

He rents space on the walls or in the window to those who may have something to sell, rent or exchange. The advantages are that the buyers and sellers of any article under the sun may be brought together in this manner and consummate their deals without the necessity of paying brokerage fees or excessive advertising sums.

"Aquagig" Is New Water Sport

BUILT of a flat disk of metal some six feet in diameter, with a piece of steel pipe running up from its center to afford a handhold for the participants, the "Aquagig" shown in the photo below is the latest device for water sports. You can easily make one after studying the picture.

The object of this water sport is to avoid being thrown off the revolving "Aquagig," as the gadget has been called.

SPARKS from the RADIO EDITOR

Edited by L. B. ROBBINS

Code Practice from A. C. House Wiring

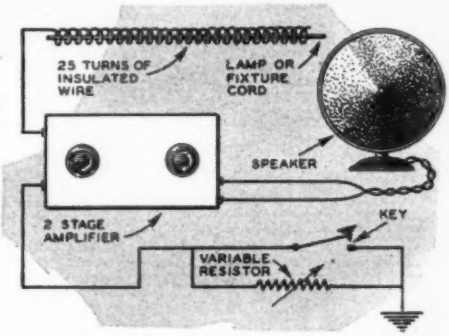
MOST every radio club or group of amateurs would like some means of studying code without the expense of rigging up a special outfit for that purpose.

The method shown herein is ideal because it uses the 60 cycle note induced from the electric light lines. All you need is any good speech amplifier system taken from a broadcasting set, address system or phone transmitter amplifier.

Wind a couple of dozen turns of wire around the electric light fixture cord to the room light. Bring this wire down to one input post of the amplifier. Then connect the other input post of the amplifier to one side of a key.

Connect the power supply to the amplifier and then connect the output posts to the speaker. Lastly connect the remaining side of the key to ground.

Turn on the electric light and close the key. A signal with plenty of AC will be heard in the speaker. To give a more readable note it may be necessary to shunt a resistance across the key as suggested.

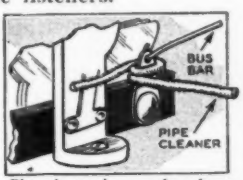


When key is pressed dots and dashes are heard in speaker. Induction hum comes from 25 turns of wire on lamp cord.

This resistance can be a ¼ or ½ meg grid leak or variable resistance up to 1 megohm. By varying the resistance the quality of the note can be regulated to suit the ears of the listeners.

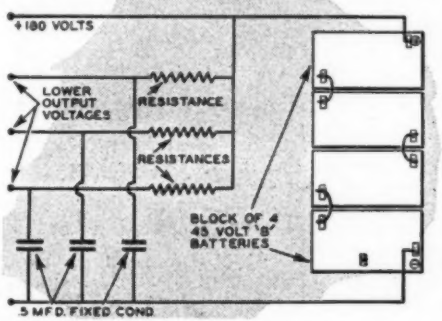
Pipe Cleaner Keeps Nut Clean When Soldering Lug

TO AVOID getting solder on the nut when you are soldering a length of wire to a lug, build a dam around it with a pipe cleaner as illustrated in the accompanying drawing. When the joint is made up, just wipe the pipe cleaner around the lug between the wire and nut, and lay on the heat. The cleaner will act as a barrier against the flowing metal, and save getting the nut soldered to the lug in the transaction.



Pipe cleaner is wound as shown above to hold back the solder.

Easily Made Voltage Divider Prolongs the Life of Receiver B Batteries



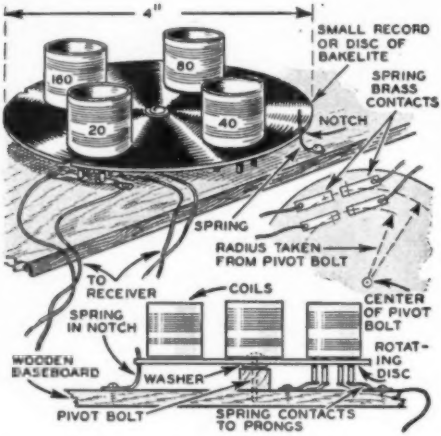
To distribute voltage draw on the batteries insert the resistances and condensers in the circuit as shown here. B eliminator resistances, receiver by-pass condensers are used.

IN A BANK of several B batteries there is always undue drain on one or two of the batteries. To even up this load will add life to the entire bank.

A scheme for equalizing this load consists of merely draining the load through a voltage divider exactly after the pattern used on a B eliminator. To determine the resistances find the voltage drop by subtracting the voltage needed from the maximum B voltage. Then R equals the voltage drop divided by the current in milliamperes needed.

If variable resistors are used then the voltage can be measured with a high resistance voltmeter and the resistor set at a point to give the required voltage. Any small B eliminator resistances can be used and receiver by-pass condensers will be OK for the job.

A Quick-Action Coil Changer for Short Wave Receivers



For quick shift of wave bands, the coils should be mounted on small record, which is in turn mounted to revolve on center block. Prongs then touch brass prongs on baseboard.

HERE is the germ of an idea as suggested by a MODERN MECHANICS AND INVENTIONS reader some time ago. It demonstrates how one using a short wave receiver employing plug-in coils can arrange them so that by the twist of a dial one wave length coil or the other can be put in the circuit instantly.

The usual short wave receiver uses four coils covering the 20-40-80 and 160-meter bands. In this wave band changer, a small toy phonograph record or disk of bakelite is used for the base.

Near the edge, and equidistantly apart, drill four sets of holes for the prongs of the different coils.

Arrange the coils in rotation from 20 meters up, around the edge, and so the corresponding pairs of prongs of each coil will face the same direction. That is, have each pair of large prongs face the inside of the disk towards the center.

Each coil can be fastened solidly to the disk by a tiny angle piece so it will not spring up from the disk.

Now mount the disk on the receiver baseboard by placing a bushing and washer under the disk and running a bolt down through the center hole upon which the disk can rotate. The coil prong ends should be lifted at least ¼ inch above the base.

Next arrange four contact springs made from springy brass upon the base so the four coil prongs from any one coil will come in proper contact with them when the coil is directly over them.

Contact Springs Made From Brass

This is suggested in the sketch but the proper shape, etc., will have to be worked out by each builder. Wire these springs to the portions of the circuit to which the coil prongs should go if mounted as usual in a socket.

Lastly, cut notches in the edge of the disk into which a stiff wire catch will spring when the prong contacts are touching the springs under them properly.

When operating properly this coil-changing disk can be instantly rotated and the coil for any band brought into position with the circuit for reception on that desired band.

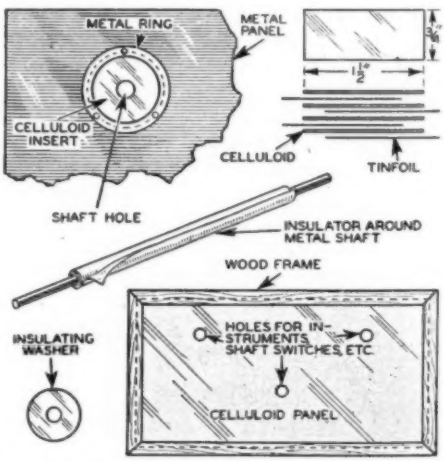
Auto Curtain Stock Makes Insulation for Receiving, Transmitting Sets

MICA is the standard insulating material in radio, but a fine substitute is the celluloid window curtain stock used in automobile work.

Instead of bakelite or fiber for insulation on metal panels auto celluloid stock can be used for the purpose with much less work. Simply cut a sufficiently large hole in the panel, as shown in the drawing, lay a larger piece of the celluloid over it and fasten in place with a metal ring laid on and bolted to the panel. Then run the shaft through a hole in the celluloid.

If a shaft has to be run directly through the metal and insulation is necessary, you can wrap the shaft with a layer of the celluloid. Duco cement will keep the lap of celluloid from unwrapping.

In a transmitter, if the apparatus behind the panel can be observed perhaps better results can be obtained. For this purpose erect a frame of wood and cover it with a sheet of heavy celluloid for a panel as illustrated.



Here are methods of using celluloid as insulators. Between tinfoil condenser plates it makes very efficient dialectric.

Easily Made Rigid Coils for the Low Power Transmitter

FOR the amateur who builds his own transmitter coils, this method will aid in building very rigid windings, although No. 8 or 10 wire is used instead of the copper tubing as often specified. Rigidity is necessary to insure steady frequency, so here is a simple way to go about making such a coil.

Wind the coil in the usual manner and space the turns as near as possible to the distance needed. Now, depending on the diameter of the coil, cut from cigar box wood two or three slender sticks for spacers.

With calipers mark off the centers of the spaces for as many turns as the coil contains. Clamp the pair or the three sticks in a vise and cut the notches half the width of the wood.

Thread Holds Windings in Place

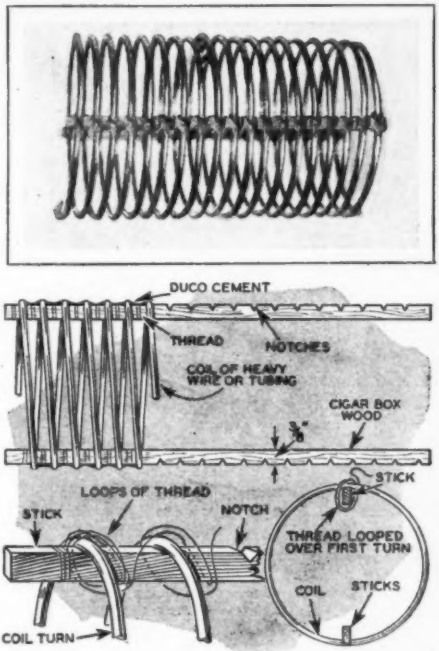
Place a stick at a time inside the coil and temporarily tie it up to the windings. Then take a length of heavy black thread and tie one end to an end of the stick.

Take a turn over the end turn of the coil, down under the stick and then two more turns over the wire in the opposite direction and then under the stick up over the second turn. Make a second loop over this turn and then under the stick and up over the third turn, thus sewing the coil turns to the stick with a pair of thread loops over each turn.

Rigidity Feature of Coil

Tie the thread to the opposite end of the stick and then with a blunt pointed needle pick up the turns over each coil turn, pulling taut, and repeat until the end of the coil has been reached. Finally take up the slack and retie.

This should effectively tie all coil turns solidly down into the stick notches. Repeat with the remaining sticks. When this is finished, spread a solid coating of Duco Cement along the entire length of the stick on the outside of the coil as shown and allow to dry several hours. When dry the coil will be as rigid as though built of one piece and can be handled without fear of bending it out of shape. It also will positively not vibrate when inserted in the transmitter if solidly clamped at the terminals.



Top photo shows completed coil. Below is shown the manner in which coils are wound on sticks.

Such a coil as this can be used with any of the transmitting sets described in MODERN MECHANICS AND INVENTIONS.

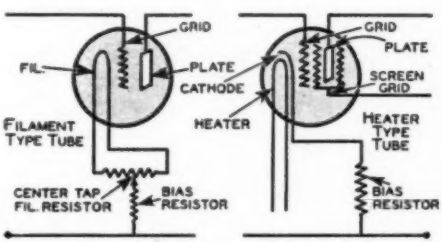
Arranging the Automatic Grid Bias When Converting DC Receiver to AC

MANY of the older style battery receivers using C batteries for grid bias are now being converted to AC operation and a resistance is used for obtaining this bias without the use of batteries.

The resistance is always inserted between the filament return and the B minus, as illustrated herewith. In the case of a purely filament heated tube this is accomplished by shunting the filament circuit with a 50 to 100-ohm resister and center tapping that. Then insert the resistance in the center tap lead to B minus.

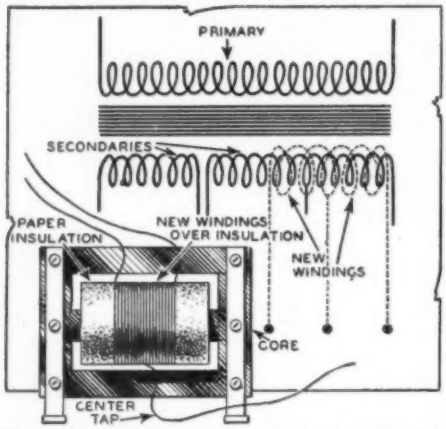
In the heater type tube the cathode leads direct to the B minus and the resistance should be inserted in that lead. Estimating resistance is simply a matter of experimentation and of knowing the characteristics of the tube used.

These characteristics are to be found on the pamphlet accompanying the tube. With these changes you can increase the efficiency of your receiver considerably.



Bias resistor is wired in at points shown in above drawing when direct current set is changed over to alternating.

How to Add an Extra Filament Winding to Transformer



Extra winding for filament is placed over the outside of the secondary coil as illustrated in the above drawing.

WITH the changes in tubes has come a demand for 2½-volt filament transformers for lighting purposes.

Old style filament transformers usually furnished only 5 and 7½-volt windings and are, of course, unsuitable for lighting these low voltage tubes. But by a slight bit of work a filament winding delivering 2½ volts can be wound right on the same core with the outlay of a few cents for wire.

Much depends upon the style of transformer, but in most cases there is sufficient room between the coil and the core to hold an additional winding.

Remove Core From Coil

In this case, remove the core from the coil. See that the secondaries are well insulated with paper and then proceed to wind on an experimental winding of any suitable wire.

Try putting on about 30 turns of No. 20 to No. 24 DCC wire, securing the end temporarily with sealing wax. Reinsert the core, plug in the primary and measure the current. If above or below the desired 2½ volts estimate about how many turns to remove or add and make the change.

Winding on the Coil

When the right number of turns are found, remove the temporary windings and wind on No. 24 wire carefully, bringing out a center tap if desired at just half the number of turns.

Catch the ends with Duco cement and then cover the wire with shellacked paper and finally with friction tape. Reassemble the core and your added voltage is complete.

To keep the voltage at precisely 2½ volts, it will be wise to add a voltmeter to the circuit, wiring it across the outside terminals. For adjustment of the voltage, a power rheostat inserted in the primary circuit will be needed. This method will permit fine regulation when the input voltage fluctuates.

These Stand-Off Brackets Keep Aerial From Grounding in Bad Weather

DURING these wet and stormy winter months the aerial or lead-in must be prevented from making contact with any part of the house or the signals will be greatly impaired by grounding.

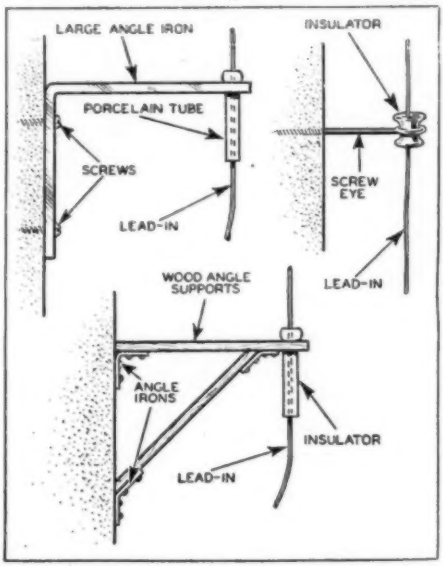
It is a simple job to make some sort of stand-off insulator to remedy the situation, and the three shown in this sketch can be quickly constructed by anyone.

One method is to buy a large galvanized angle iron at least a foot long on each leg. Drill out one end and insert a short porcelain insulator, as shown in the drawing. Run the lead-in down through that and then fasten the angle iron to the side of the house.

Wooden Frame Holds Insulator

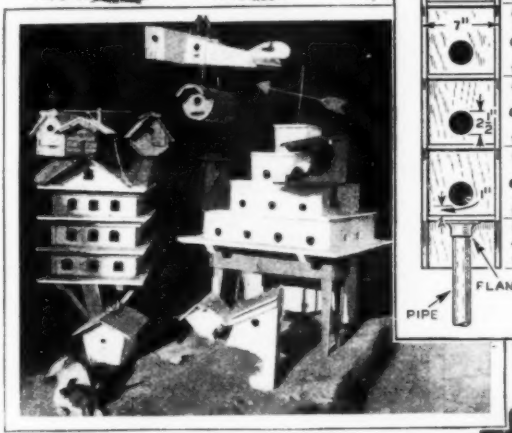
If no iron is available, you can make a triangular framework as indicated, putting the insulator through the long leg. Fasten the supporting bracket to the horizontal piece with small angle iron and then fasten the ends of the two pieces to the house with two more small angles.

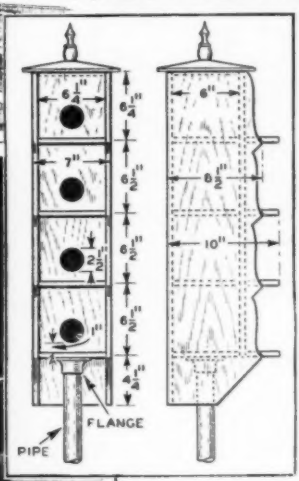
A third method is to have a piece of round iron rod bent around a porcelain thimble for the lead-in and have the opposite end threaded. This latter end can then be screwed into the woodwork as shown.

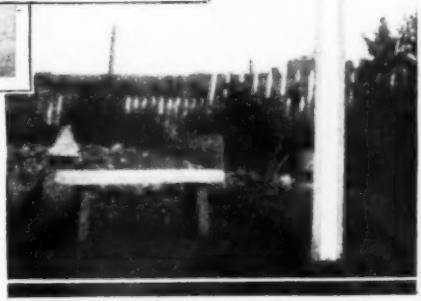


Lead-in wire is run through porcelain insulators in stand-off brackets to prevent grounding and loss of current.

Money-Making Ideas *for* Workshop Fans







Variety of attractive and unique shapes in which bird houses can be built are illustrated in the photo above.

Dimensions for the four compartment martin house are given in drawing. Note particularly the inner size of compartment, diameter of hole and height from floor. Photo shows sturdy and decorative method of mounting house.

Build Martin Houses for Neighbors

NO DOUBT the greatest revenue the home workshop owners can derive at this time of year is from the sale of bird houses. The sparrow-proof martin house, shown in the accompanying drawing, can be built in 3, 4, 5 or even 6 compartment sizes, and should retail in most neighborhoods for about $2.00 per compartment. Besides this there is the usual run of blue bird, wren, flicker and robin boxes.

The martin is a fussy bird, easily dissatisfied. His artificial home must be just so. The compartments must measure exactly 6 by 6 by 6 in. inside measurements, and the round hole must be 2½ in. in diameter and not over 1 in. above the floor.

Compartments Built in Groups

There must be a ledge at the front door, and several compartments should be grouped together, since martins are exceedingly neighborly. Besides this, the house should be raised at least 16 feet above the ground and set not too close to any buildings or trees.

Complete dimensions for a neat, homey little house are given in the accompanying drawing. The sides are ¼ or ⅝ in. thick boards, the front edges of the side pieces being given an ornamental design which can be cut out with a band saw.

Of particular importance are the ledges. These fit loosely between the protruding edges of the sides, in line with the floors just back of the front wall. They should be approximately 3 in. wide. Each back corner is fastened with a small screw or nail driven through the sides. The ledge then rests upon small brads or nails driven part way into the very front edge of the sides in such a position that they will hold the perches level when they are down.

If you erect the houses some time before the martins arrive, you can thus tip up the ledges and keep them closed against sparrows.

For mounting the bird house, secure a pipe flange to the bottom of the lowest compartment, and screw into this the end of the pipe mast. The roof is simply an 8 by 8 piece of wood nailed to the top.

Huge Vacuum Cleaner Sweeps Golf Links to Find Balls

Working on the principle of the household vacuum cleaner, this machine scours golf courses to pick up unsightly debris. Old auto motor powers fan, delivering debris to auto.

SEARCH for golf balls lost in dried cut grass may no longer be a bugbear to golfers, thanks to a giant vacuum sweeper, recently invented, that picks up leaves, grass, paper, etc., from fairways.

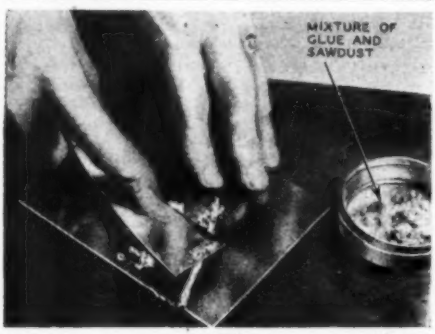
Utilizing the principles of the ordinary household cleaner the unique machine, shown above, is capable of clearing debris from nine golf fairways in one day.

A "planer blower," mounted on a trailer, furnishes the suction, drawing the debris with such force that it is blown through a long pipe into a cage built on a motor truck. An old automobile motor mounted on the trailer furnishes power for the blower.

Debris on golf course is sucked up through this four-foot nozzle, suction being regulated by speed of fan motor.

Simple Cement for Glass Mending

A CRACK in a glass showcase, window, or other article can be mended, temporarily at least, by filling it with a mixture of glue and sawdust. Separate the glass pieces slightly, so that there will be a space into which the cement can be forced with a putty knife. If the repair is to be exposed to water, use casein or other waterproof glue.



To mend glass, separate the pieces slightly, then force the cement into the crack with a putty knife as shown above.

Four Things Science Doesn't Know

FOUR processes which industry has used for generations without really understanding any of them were listed by Sir Frank Smith, British scientist.

The oldest of these is the use of oil or grease for lubrication, an invention made even before the development of any machines except very simple ones like mere wheels or rollers. Yet modern physical chemists admit that they do not really understand why films of oil act as lubricants.

Another ancient invention is that of making different kinds of iron or steel by leaving definite quantities of impurities such as carbon in the metal. Modern metallurgists are just beginning to discover what happens in these instances; making the difference, for example, between cast iron and steel.

Coal has been heated to make gas for more than a century, yet this process, too, is not well understood. British coal interests now are trying strenuously to improve it by scientific research.

The vulcanization of rubber by heating it with sulphur was the fourth example of an industrial process still not understood.

Amateur Electrician

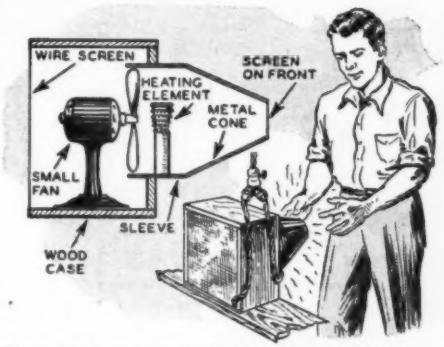
Edited by SEWELL LEHMAN

Heater Element, Fan Make Hot Air Drier

A HOT air drier for the hands is not necessarily a complicated piece of mechanism. In fact, you can make one quite easily from a small electric fan, a heating element (550 watts) and a few scrap pieces of wood and sheet metal.

The drawing at the right shows how the drier is assembled. The fan should be mounted in a wooden case, which is backed by wire screen to admit the air. In the front of the case is cut a large circle to take a metal sleeve, in which the fan blade revolves.

The heating element is mounted in this sleeve, so that all air from the fan sweeps by it on its way out the cone. To this sleeve is soldered a metal cone, with an aperture of about two inches in diameter at the front, covered by a screen also. Wire up the fan in the usual manner.

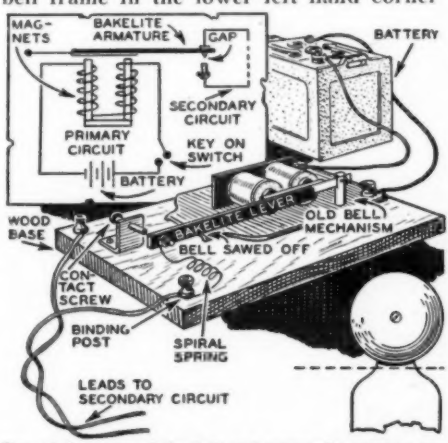


The small electric fan should be mounted inside the case as shown here. The air blast is directed past the heating element and out through the metal cone to the hands.

Efficient Relay for Remote Control Circuit Made From an Old Door Bell

ANYONE wanting a relay to cut a circuit in or out can make one quickly from an old electric bell. The cost is practically nothing and it will work just as nicely as the manufactured type when carefully constructed.

First remove the bell and then saw off the neck of the frame at about the point suggested by the dotted line. Mount the bell frame in the lower left hand corner of a piece of board suitable for the job.



Cut off the gong of the bell and mount the magnets on the baseboard as shown above. Contact points are bolted to the bakelite lever. Wire up as shown in the diagram.

Remove the little contact on the form by which the armature is made and broken in the bell circuit and then wire the two magnets together and bring the leads out through the binding posts to the battery circuit and switch or key.

Armature Made of Bakelite

A narrow strip of bakelite is then riveted to the armature and the outer end fitted with a contact bolt as shown. Stand the relay on edge and fasten a small spiral spring to this contact bolt and raise the armature away from the magnets about ¼ inch. Then attach the spring to a binding post.

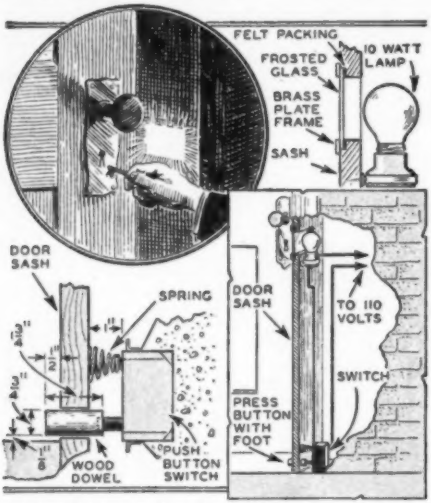
Below the contact on the armature lever place a small brass angle containing a contact screw as indicated and wire the angle to a second binding post. These two latter posts connect to the secondary circuit.

Adjusting the Contact Screw

Now adjust this contact screw so that when the armature is drawn down by the magnets the contact bolt in the lever will touch it and complete the secondary circuit before the armature can touch the magnets.

The diagram shows exactly how this circuit works and by following these suggestions you can make a nice little relay for use in a transmitter remote control keying circuit or for operating a charger, etc., as desired.

Keyhole Light Is Turned on When Foot Presses Button



Switch and lamp are built into wall as shown in drawings.

YOU won't have to grope around in the small hours of the night looking for the keyhole if you install in the door sash this novel scheme for illumination. All you have to do is to hunt around with your foot for a little peg at the base of the door, give it a push, and presto! the keyhole stands out like a house on fire.

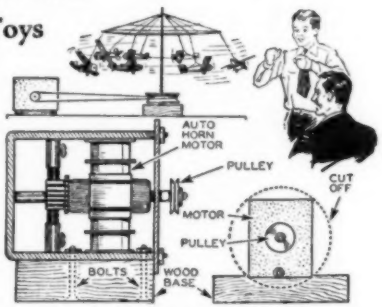
Drawings for installing the pushbutton switch and lamp in the door sash are given at the left. Mount the switch in the wall, one inch from the inner face of the sash, as illustrated. The spring, inserted in position shown, presses against the "off" button, so that the light is turned off when pressure of the foot is released. The wood dowel passes through the door sash and rests against the "on" button.

Mount the lamp beside the keyhole, inside the wall. Cut a square hole in the sash and on the front secure the frosted glass, which is held in place by a brass plate frame, padded with felt packing.

A 10-watt lamp will provide plenty of illumination. The lamp and the button are hooked in series and the outer wire run to the house line.

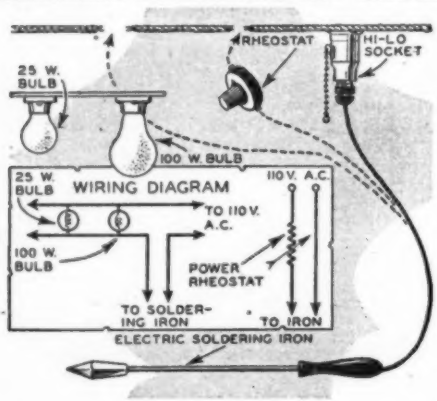
Old Auto Horn Makes Motor to Run Toys

AN OLD auto horn has many possibilities. For instance, you can easily use it as a motor to run small toys such as electric trains. First, however, you have to operate on the thing. Cut off the casing, then mount what is left on a baseboard for rigidity, as illustrated in the accompanying drawing. On the armature shaft, which protrudes through the front, secure a small pulley, to which is connected whatever device you wish to operate. It might be advisable to clean up the armature and get some new brushes if you want first class results. A six volt storage battery, wired to the terminals of the motor, will furnish plenty of juice for any job you've got for the motor.



Here's how horn motor is mounted on baseboard.

Resistance in Line Reduces Current to Prolong the Life of Solder Iron



Inserting power rheostat or bulbs in the circuit cuts current.

IT'S NOT always necessary to have your soldering iron running full blast when you're doing a soldering job. You can prolong its life considerably if you will take pains to cut down the juice when the iron is not performing heavy duty service.

About the best and most convenient way to regulate your iron is to plug it into a Hi-Lo socket, which you can obtain at almost any electrical supply store. When you want to cut down the juice all you have to do is yank the chain, and a resistance is automatically cut into the circuit.

A healthy power rheostat will also do duty here. Simply insert it in the line at the point shown in the accompanying wiring diagram. Adjusting the resistance adjusts the current to the iron.

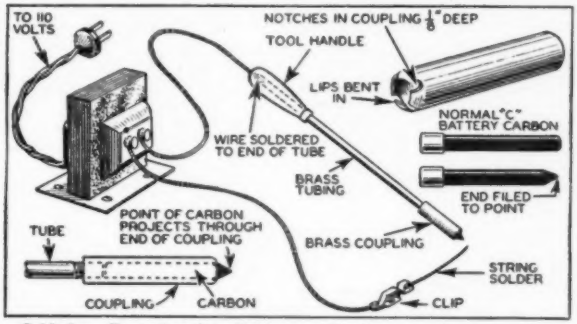
A 25 watt lamp hooked in parallel with a 100 watt bulb makes an efficient resistor to cut down the juice. Hook these up in the main line as illustrated.

This Soldering Iron Operates Off Transformer or Battery

HERE is an iron that will do small jobs and run from a 6 volt battery, a toy train transformer or from a 32 volt system very nicely.

Find an old wooden tool handle and a piece of brass tubing about ⅜ inch in diameter and 6 inches long. Drill a hole through the length of the tool handle into which the tube will just make a driving fit.

Thread the other end of the tube. Now solder the end of a length of single strand insulated wire to the inside of the threaded end of the tubing. Run the wire through the handle and follow it by driving the tube into the handle nearly the length of the latter.

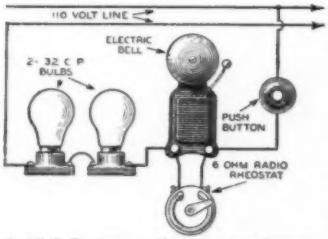


Soldering clip and carbon holder are wired to transformer as shown.

The soldering end is made as follows: Remove the round carbon from an old flashlight cell. Grind the plain end to a point, leaving the brass capped end intact. Then get a long brass ⅜ inch coupling and slot one end back in three or four cuts ⅛ inch deep. Bend these pieces down slightly across the end of the coupling as in sketch and push the carbon into the coupling. Then thread the coupling onto the tube so the carbon is held firmly in position.

To use the soldering iron, connect the wire leading from the handle to one pole of the power source. Then connect a second piece to the other side of the power and fasten a clip to the other end. Clip this to the piece of solder.

Bring the soldering iron carbon down on the end of the solder over the spot to be soldered and you will be surprised how easy it is to do the job.



2 32-C. P. lamps eliminate transformer.

Lamps Reduce 110 Volts for Use on Door Bell

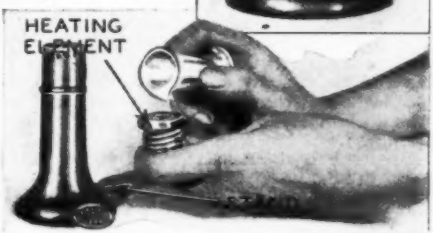
TO OPERATE an electric door bell without batteries or transformer, simply insert two 32 c. p. electric lamps in series in the electric bell line as shown in the accompanying drawing. A single 16 c. p. lamp can be used if desired, provided some such a resistance as an old six ohm rheostat is hooked into the line as indicated in the diagram. Insert pushbutton at the point shown.

Small Electric Stove Made From Cigarette Lighter

A TINY electric stove that will be found handy for heating evaporating dishes in the home laboratory can be easily made with an ordinary electric cigarette lighter. The stove will also be found useful in the workshop for heating small quantities of glue and other substances.

After taking the element out of its holder, remove the perforated mica disc that protects the coil in ordinary use. Cover the coil evenly with a mixture of plaster of Paris in two parts water with one part sodium silicate (water glass). When this has hardened, file the surface down perfectly smooth and replace the element in its holder.

The plaster will protect the coil from the atmosphere and therefore it will last indefinitely. At the same time it allows of close contact with the small dish to be heated so that the stove is much faster than any that can be made with bare, exposed elements. If you've got some heavier heating jobs to do, you might hook two or three of these elements in parallel.



Cover heater element with coating of plaster of Paris.

A HIGH-POWER Spot Light

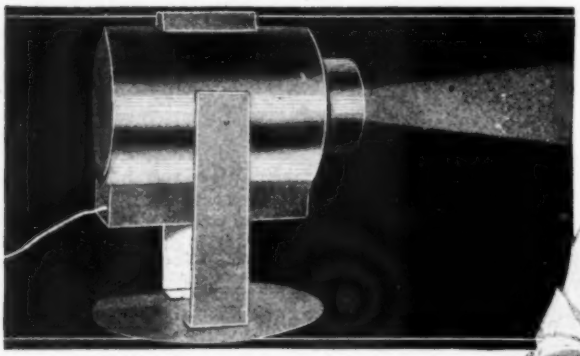


Fig. 1. Here is the completed spot light, mounted on a circular base so that it can be swung into any position. Lamp house swings up and down on the pivots in uprights.

Fig. 3. For ventilation of the lamp house a slit in the top is provided and covered with a guard to prevent escape of light.

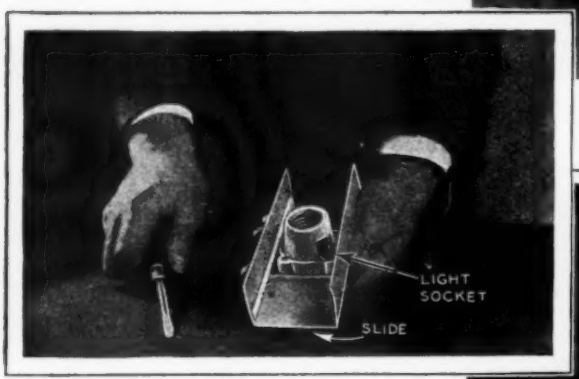


Fig. 2. The socket moves freely back and forth in the incandescent lamp holder to alter the size of the spot, and the flanges keep it in a level position, as shown above.

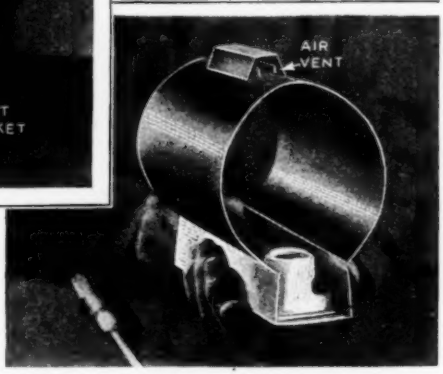


Fig. 4. In above photo the lamp house and lamp holder have been soldered together and are ready for the ends. Heavy bright or galvanized sheet tin is used for the house.

YOUR amateur stage production will go over with a louder bang if you bring this spot light into action at the proper place and time. And meanwhile you will also find it extremely serviceable in your photo gallery when you are making portrait photographs.

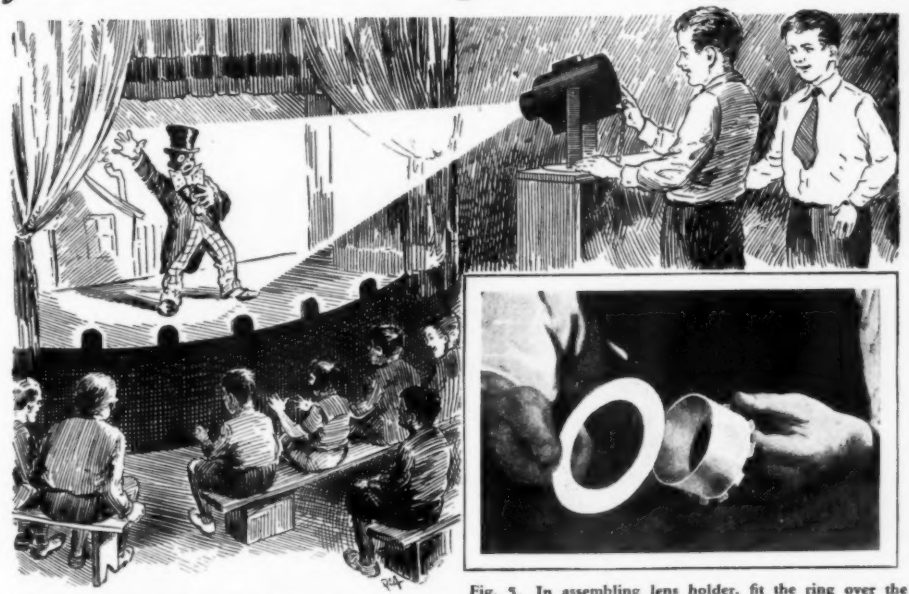
"Spots" used professionally, as in motion picture making and in modern portrait studios, run into prohibitive prices. In the accompanying illustrations, however, it is shown how you can construct a home-made spot light at a very low cost—not exceeding four dollars, which includes a high-wattage lamp.

Heavy bright or galvanized sheet tin is used. The "lamp house" shell, as shown in Fig. 3, is made of a piece of the tin 7½ inches wide and 15½ inches long, with ¼ inch turned edges on the ends, and bent to shape. In the top a ventilating slot is cut, and covered with a small bent piece of tin to exclude the light.

The lamp holder, which is soldered to the lamp house, is 5½ inches wide and 7½ inches long. The sides are turned up 1½ inches, leaving a center track 2½ inches wide. The lamp socket, soldered to a square of tin, slides in the track thus formed, and is held level with strips of tin on each side as illustrated in Figs. 2 and 4.

Two discs are cut from another piece of the tin, 5½ inches in diameter. The one

for Amateur STAGE Shows



Artist's drawing above illustrates the proper use of the spot light at your amateur stage production.

Fig. 5. In assembling lens holder, fit the ring over the tube and solder securely to the lamp house.

for the front is cut to form a ring and accommodate the 3½-inch diameter lens barrel, to which it is soldered. This in turn is soldered to the front of the lamp house.

A 3½-inch condensing lens is placed in the barrel, with the convex side facing the interior of the lamp house as shown in Fig. 5. Circular rings fitting inside the barrel retain the lens in position.

For a base use a large circular piece of tin with two uprights soldered in place, and the lamp house riveted to these so that it will swing up and down easily. (Fig. 1.)

The incandescent lamp used may either be of 400 watts or less, as these all fit the regular sockets. The intensity may be increased, however, by silvering a spot on the lamp opposite the lens.

How to Silver the Bulb

Make a three-inch circle from a strip of waxed paper and place it on the lamp as illustrated in Fig. 7. Dissolve a gram of silver nitrate in an ounce of distilled water, and add ammonia until the solution becomes dark and again almost clear.

Several drops of liquid formaldehyde are quickly stirred into this and at once poured on the lamp, inside the retaining paper wall. Within five minutes the spot will be covered with a silver coating that gives a mirror reflecting ability. That part of the globe to be silvered should of course be well cleaned and polished before covering with the solution.

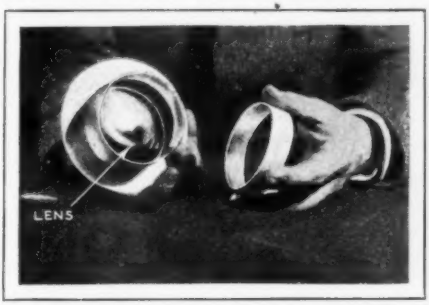


Fig. 6. Here is how the lens is fitted into the holder. The lens is held by the ring with flat side out.

Fig. 7. A mirror is made on the rear of the incandescent lamp by pouring the solution into the waxed-paper cup.

Pontoons Form Hull of Non-Capsizable Lifeguard Boat

On twin pontoons of "Safeboat" is mounted seat for lifeguard and a chair to accommodate three extra passengers.

WHAT'S new afloat? Here's what's new—a contraption called a "Safeboat."

Introduced recently on the west coast, this "Safeboat," shown in the photo above, consists of two water-tight pontoons, each thirteen feet long, upon which is built a raised seat for the navigator and a bench for three extra passengers.

Because of its width and low water displacement, it is almost impossible to capsize the "Safeboat." What is more, if necessary, fifteen people can be carried on the decks, so buoyant is the boat.

Movies Aid Firemen's Efficiency

With movie camera mounted on platform on rear of motorcycle, Paris firemen film fire-fighting procedure. The pictures are later studied to increase the department's efficiency.

FIREMEN of Paris, France, have devised a novel method of improving their fire fighting efficiency. They take movies of the various stages of the battle with the flames, and later study the films to see where they could have done better.

The movies of the fire are made from a special camera mounted on a platform on the rear of a motorbike.

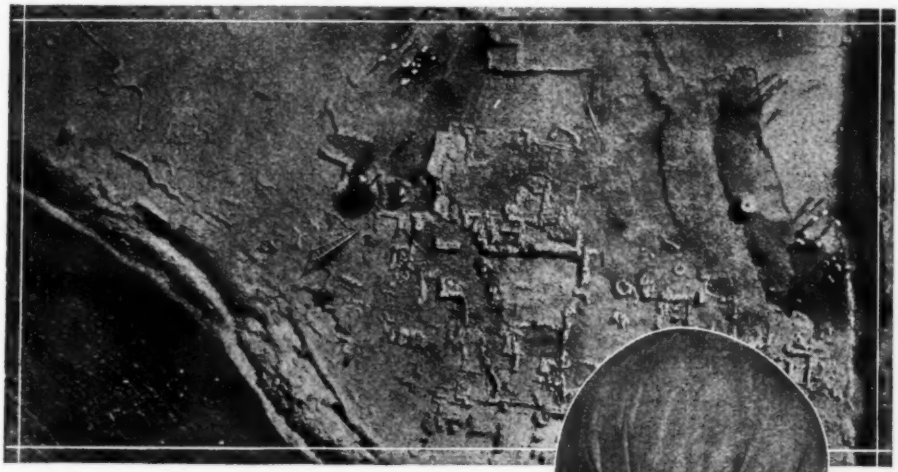
Hat Is Latest in Cigarette Cases

AN "ammunition" hat designed with tuck in which are inserted twenty cigarettes, is proclaimed by stylists as the latest fad for co-eds. Wearing this hat, shown in the photo at right, the co-ed needs no longer go through the awkward motions of searching through a hand bag for her fags. All she has to do is to reach up and pluck one from her hat.

The cigarettes are arranged to appear like ornaments on the hat. The slots which hold the fags are made extremely rigid so as to prevent breaking.

When milady wishes a cigarette, she simply reaches up and plucks one from her hat.

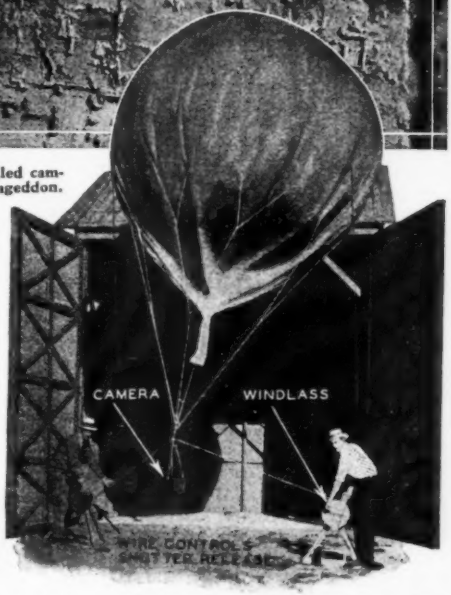
Camera in Balloon MAPS Ancient City



Here is aerial photograph, taken from automatically controlled camera suspended from captive balloon, of ancient city of Armageddon.

A NEW departure in the way aerial photography was introduced by the archaeological expedition of the Oriental Institute, University of Chicago, when a captive balloon was sent aloft with a camera to map the ancient city of Armageddon.

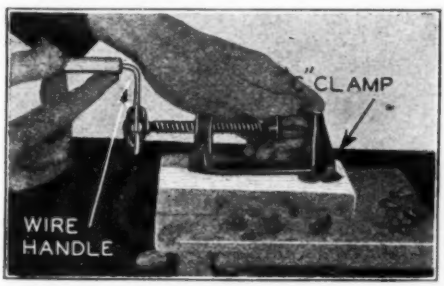
The camera, suspended from the balloon as shown in the accompanying photo, was equipped with an electrically operated shutter, the current being supplied by wires following the anchor cable. A photo of the ancient city of Armageddon, made with the camera, is shown above.



Aerial camera was suspended from meteorological balloon, belonging to University of Chicago expedition, as shown here. Control wires for camera followed the cable.

Make Nut Cracker From C Clamp

AN ORDINARY C clamp or quilting frame clamp, mounted as illustrated in the photo below, makes a convenient and sure fire nut-cracker. A wire arm is fastened to the head of the threaded screw of the clamp and bent to form a turning handle. The flat C flange is held between two strips of wood, to which the clamp is anchored.



Nuts held lengthways between the jaws are easily cracked. The wire arm fastened to the key serves as the handle.

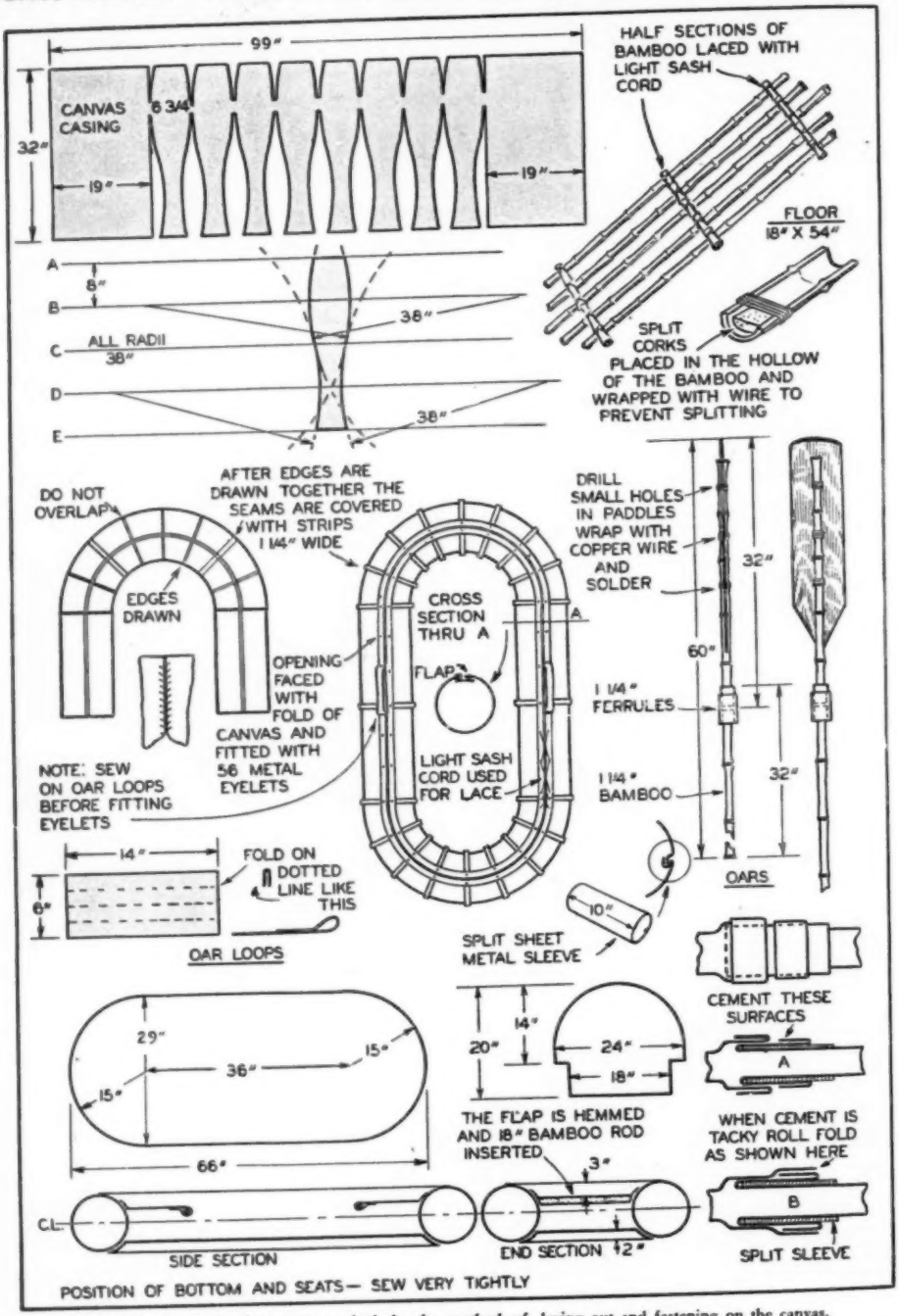
Driving Destroys Eyesight Fringe

BERLIN oculists report the discovery among automobile drivers of a curious eye disorder believed to have caused several recent traffic accidents.

In this condition, the field of vision of the eyes is greatly narrowed. Objects at which such a person looks directly are seen as well as ever, but anything much to one side or the other of this direct view is seen dimly or not at all.

It easily may happen, therefore, that a car approaching from a side street or a pedestrian who steps quickly into the roadway may be entirely unseen by a driver who has this defect.

Close Attention to These Details Will Make a Rigid, Watertight Boat



In this detail drawing, note particularly the method of laying out and fastening on the canvas.

Collapsible Pontoon Boat

by DICK COLE

Fishermen will find their greatest problem solved with this easily made, collapsible pontoon boat which can be inflated or deflated with little effort. As it is very rigid and does not draw much water, you easily navigate the shallowest ponds and fish for bass in their most secluded haunts.

LIVES there the sportsman who does not know of some isolated, woodsy pond well off the beaten track, and who visions bass "as long as his arm" lurking beneath the lily-pads, hungrily awaiting a tempting bait? But the sportsman can invade these domains only in his imagination, because no boat can be hired, and approach and invasion can not be made otherwise. To meet such conditions, the collapsible pontoon boat is especially suitable, because of its extreme light weight and its portability.

The pontoon boat illustrated consists of an oval, tubular casing made of closely-woven canvas, to which is sewn a canvas bottom and seats. Sections of large, balloon tire tubes are joined together to form one endless tube, which is laced into the canvas casing and over-inflated to ten inches in diameter. Lengths of bamboo, split in half, make a collapsible flooring. A boat built to the specifications given will have a buoyancy of about 600 pounds—ample for two passengers.

Before going into constructional details, it is well that the prospective builder should study the plan and gain a good mental image of what he is to build.

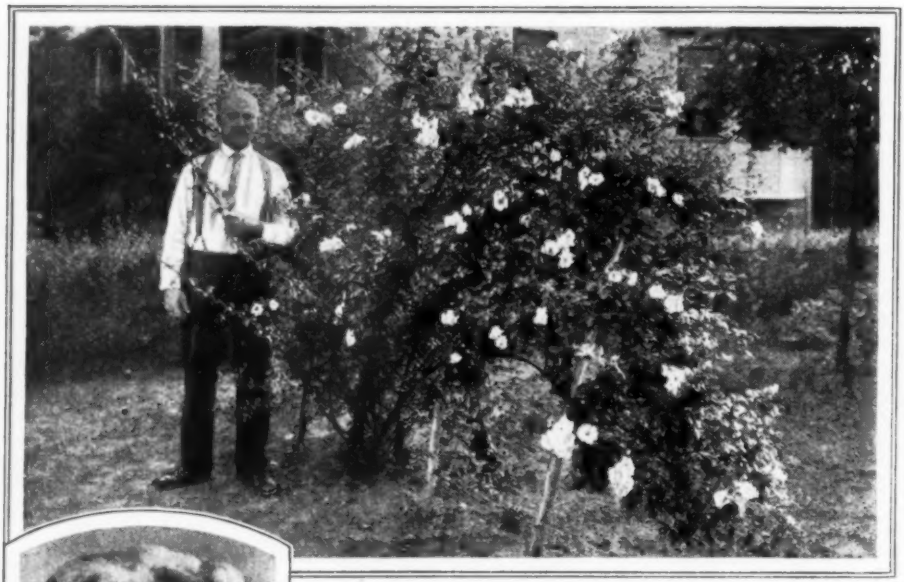
A piece of canvas 32″x99″ is tacked lightly to the floor and the pattern which looks like a series of dumb-bells laid off. First, a templet should be made. The best way to go at this is to draw five parallel lines 8″ apart as A-B-C-D-E. Then, with a 38″ radius, describe the inter-joining arcs. The centers of all arcs are on lines B and D. The maximum width of the templet is 6¾″. It can be made of stiff cardboard or sheet metal. After the templet is made it is a very simple matter to lay off the pattern. One piece makes one-half of the tube casing, so, of course, two such pieces are necessary.

The next operation, after the pattern has been cut out, is to draw the edges together with heavy cotton thread—do not overlap. The canvas will now form into a U-shaped tube with an opening all around the center of the top. Next, strips of canvas 1¼″ wide are sewn over the ragged seams. Unless one has a sewing machine capable of handling this work, these strips—in fact, all the sewing hereafter—should only be basted in place, and when the parts are all assembled, a tent or awning maker can do the permanent sewing.

After all the seams have been covered the two U sections are joined together, forming a tubular oval. The edges of the slot around the top of the casing are faced with canvas strips. Note that one strip is left sufficiently wide to fold back underneath to form a protective flap, like the tongue of a shoe. The oar loops are now made and placed ap-

(Continued on page 174)

There's MILLIONS in



First patent to be granted by the U. S. Patent Office on a plant has been issued to F. Bosenberg, of New Brunswick, N. J., who is shown above with his creation. The patent covers the ever-blooming feature of a climbing rose.

At the left is the late Luther Burbank, the greatest plant wizard the world has ever known. He would have been many times a millionaire had the new patent law recently passed prevailed during his lifetime. The plumcot, the Bartlett plum and giant poppy are few of his achievements.

IF YOU are an expert on plant life, or aspire to become one, then listen to this good news from Washington:

President Hoover has signed a bill which eventually will make millionaires out of plant wizards who are able to develop an entirely new variety of flower, fruit or other plant.

In a word, the measure gives the same legal backing to a plant inventor that the patent laws hitherto have given only to inventors of new mechanical devices.

More specifically, the new law authorizes the issuance of a patent, extending over a period of 17 years, "to any person who has invented or discovered any new and useful art, machine, manufacture or composition of matter, or any new and useful improvements thereof, or who has invented, discovered or assexually reproduced any distinct and new variety of plant other than a tuber-propagated plant, not known or used by others in this country, before his invention or discovery thereof, and not patented or described in any printed publication in this or any foreign country."

How Burbank Missed a Fortune

Let's consider what some of the plant wizards of other days might have accomplished, financially speaking, if this new law had been in effect during their lifetimes.

Naturally we turn our attention first of all to that genius without a peer, the late Luther Burbank, who unquestionably would have been many times a millionaire if plant patents had been issued while he was startling the world with amazing new discoveries.

Here are only a few of his outstanding achievements: the primus-berry, a union of blackberry and raspberry; the plumcot (apricot and plum); the giant poppy that measures ten inches across its bloom; the white blackberry; a dahlia minus the characteristic nasty odor; and the Bartlett plum, the plum that looks almost exactly like the ordinary plum but with a flavor similar to a Bartlett pear.

Plant Patents

by JAMES N. MILLER

Above—Dr. E. W. Brandes, famous government scientist, in his laboratory examining specimens of sugar cane. His efforts save sugar producers thousands of dollars yearly. Right—Bush of the Van Fleet raspberry, developed by government breeders.

Other scientists also just missed great fortunes. There was, for instance, William Saunders, plant scientist of the Department of Agriculture, whose most important contribution to the world is the delicious Washington navel orange. Today this fruit probably has an annual crop value of many millions of dollars.

Plant Breeders Solve Economic Problems

Very frequently, according to government experts, it is practically impossible to secure anywhere in the world crops which can meet the changing biological or economic conditions found in the United States. Whereupon the plant breeder sets to work to combine needed qualities found in several different varieties of plants.

This is particularly the case, authorities have found, when a plant resistant to disease is desired. The combination of characteristics desired must be worked out by the plant breeder.

One specific problem, which is already causing considerable comment among plant breeders, is involved in the development of a new kind of plant by two persons.

Let's suppose that a new variety may appear on a tree belonging to one person

Here is shown a government plant pathologist in laboratory at Washington studying plant diseases. The world eagerly awaits new types of plants that will withstand the ravages of diseases.

and that somewhat later a similar variety may appear on a tree belonging to another. If the first person had patented his new variety, the right of the second person to propagate the similar variety which nature developed on his tree might well be questioned.

Three applications from "plant patent lawyers" have already been received by the Patent Office for authority to practice before the Office in plant cases.

Things to Make with Tools

Edited by A. NEELY HALL

"Stepladder" Stand Decorates Corners

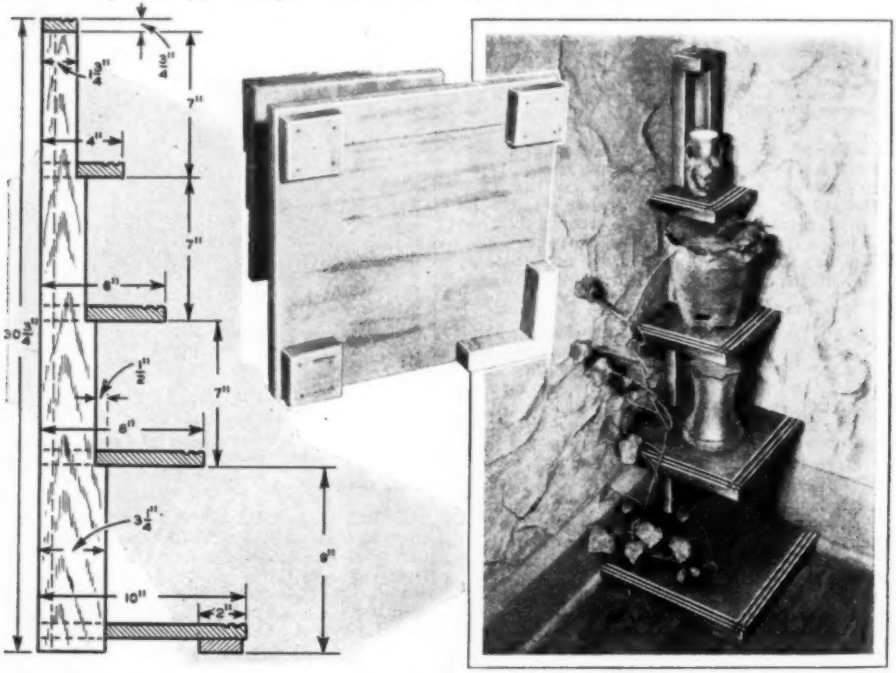
ALTHOUGH primarily designed to occupy a corner, this stand of unusual design, somewhat resembling a stepladder, will serve almost anywhere as a holder of flower pots, ash trays or other objects.

To construct the stand you will need 10 pieces of wood, all cut from ¾ inch stock. Any kind of wood can be employed, although the finish to be used will determine to some extent its exact nature. For lacquered surfaces, poplar or gum is suitable.

Dimensions of the various pieces, with quantity required, are: Two uprights having four successive steps, each ½ in. deeper than the one below it (each upright is 30 inches long, and the maximum widths, measured at the base, are 2½ and 3¼ in. respectively); one piece 10x10 in. for the base; one piece 8x8 in.; one piece 6x6 in.; one piece 4x4 in.; three pieces 2x2 in.; and one piece 1¾x1¾ in.

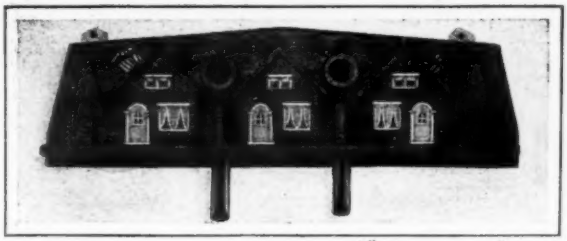
Rip the two 30-in. strips to their maximum widths, and then cut the steps. A band saw is excellent for this, if provided with a suitable guide. The two pieces are nailed and glued together with a simple butt joint to form a corner upright, the larger one with its upper surface 1½ in. from the bottom, and each of the others, in successively smaller sizes, with their under sides resting on the ½-in. steps.

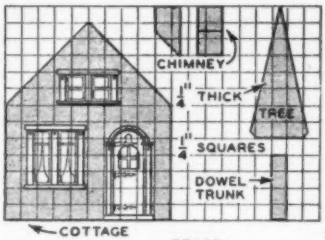
The three 2x2 in. pieces are placed beneath the three outer corners of the 10x10 in. base, to form little supports or feet. The 1¾x1¾ in. block rests on top of the upright. Be sure that the shelves are rigidly fastened to the uprights.

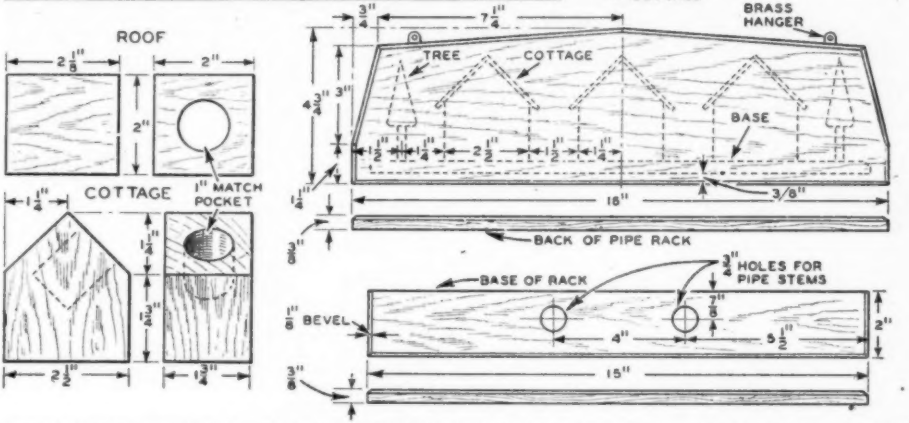


Two 30 in. uprights are nailed and glued together with simple butt joint, and shelves rest on steps as shown in drawing. 2x2 in. blocks nailed to bottom make the feet. Shelves can be provided with molded edges by means of molding cutter or shaper.

Lilliputian Houses and Trees Decorate Novel Pipe Rack







Stems of the pipes are thrust through holes in the baseboard, bowls being held by the roofs. Matches are placed in pocket in the roofs. After finishing the holder, fasten a pair of brass hangers to the rear of the rack as shown.

YOU will want one of these unique racks on the wall of your den. The photograph shows a two-pipe rack, but you can house more pipes by extending the back and base boards and adding cottages.

The end cottages have match pockets in their roofs, and pieces of sandpaper are fastened to the under side of the base board for match scratchers.

Patterns for the back and base boards contain the dimensions. Use stock ⅜-inch thick. Bevel the face edges of the back board, and the front and end edges of the base board, as indicated.

Bore a pair of holes through the base board in the positions located for pipe stems to stick through. Glue and nail the base to the back board ⅜-inch above the bottom edge.

Assembly of the Rack

Cut the cottage blocks from a piece of 2-by-4. Dimensions are given upon a front and side elevation. Bore a 1-inch hole in the side of the roof of two blocks for match pockets. Cut the roof boards out of ⅛-inch stock (cigar-box wood will do), and bore the match pocket holes to come over the holes in the blocks.

Glue and brad the roof boards in place, lapping the longer board over the end of the shorter board. Draw the door and windows upon paper, first with pencil, then with ink. Fasten them to the cottages with glue or cement.

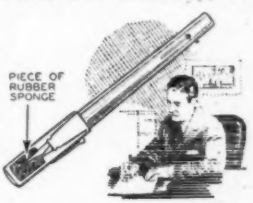
Mark off the positions for the cottages on the base board, as indicated on the back board diagram. Glue and brad them in place. Then cut the chimney blocks and fasten them to the roofs and back board.

The trees at the rack ends have trunks made from a ¼-inch dowel stick, and the tops are cut out of ¼-inch stock.

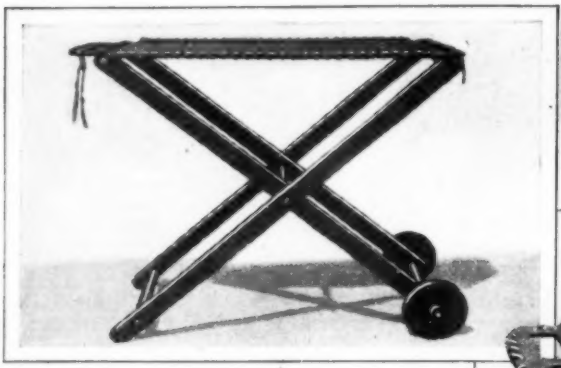
The model in the photograph has a stain finish, but possibly you will prefer lacquer or enamel, using any combination of colors you may wish.

Sponge Keeps Pen Ready for Action

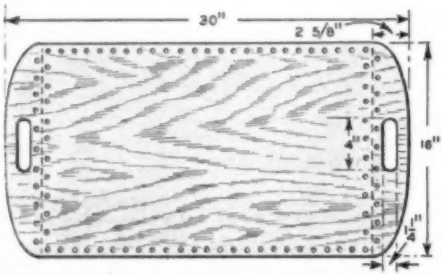
LOW priced fountain pens have a way of drying out at the point, making necessary a severe shaking before each writing session. To overcome this difficulty, cut out a small piece of rubber sponge and thrust it down into the cap of the pen, as illustrated in the accompanying drawing. The pen is then always ready for action.



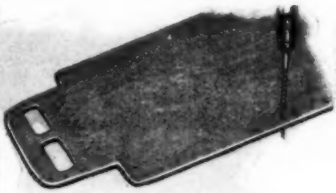
Rawhide Lacing Ornaments

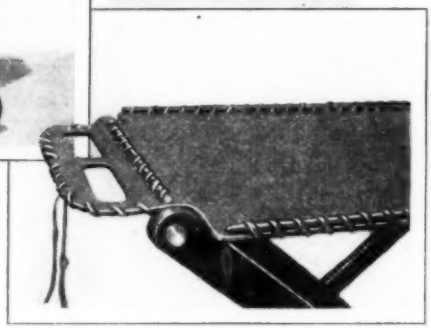


Completed tea wagon, shown above, may be trundled about easily. Wooden pegs and rawhide laces hold wagon together and serve as trimmings.



3-ply wood for tray has ends rounded as illustrated here. Bore the small holes around the edge with 3/16-in. bit, spacing them 1 in. apart. Dowels to form ridges are laced in place with 72-in. rawhide thongs, with tassels on ends.





Bore holes in edge of plywood with bit as demonstrated above. Lower photo illustrates how rawhide thongs are laced over dowels and through holes in edge of the wood.

THIS quaint and gorgeous little tea wagon, so rich in its simplicity and Old World style, is a throw-back to the days when living rooms were called "parlors" and papa wore a straw hat with a black string tied to it to keep the wind from blowing it away and Junior wore a Buster Brown collar. Remember?

Not one nail, screw, or other metal parts are used in the construction of the entire tea wagon. Wooden pegs and rawhide laces hold the wagon together and serve as trimmings, too!

How Legs Are Made

The legs are made from 1"x1¾" poplar or white pine. Cut the ends of these pieces square, mark off the location of the holes and bore them with a ¾" wood bit. Be careful to note that all four legs are not alike.

Take a drawing knife and go over all four sides of each piece and trim out little chips. It must have a "whittled-out" appearance when finished. The ends of the legs are rounded with a pocket knife.

The axle and spacers are cut from 1" doweling. Dimensions of these parts are given in an accompanying drawing. Go over each spacer and the axle with a pocket knife or drawing knife and take off small chips just as you did with the legs.

The wheels are solid and are cut from 1" poplar or white pine. They are 6" in diameter and have ¾" holes in their centers, as shown in the drawing. Go over them with your drawing knife just as you did with the legs and spacers.

The top of the tea wagon is cut from 3-ply wood with the aid of a scroll saw. The small holes bored around the edge of the top are 3/16" in diameter and are spaced 1" apart.

Doweling Lashed to Edges

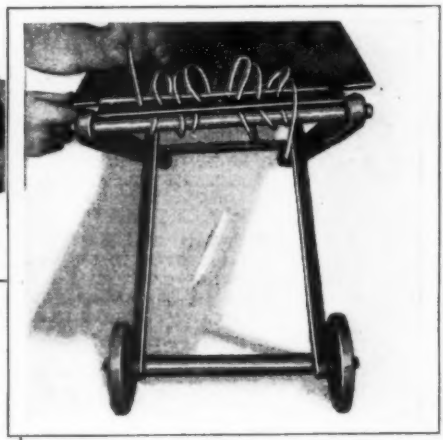
Four pieces of doweling are lashed to the top to form a ridge to prevent dishes from sliding off. The long pieces are 28" in length and ⅜" in diameter. The two short pieces are not the same length but are 10½" x⅜" and 12"x⅜".

These pieces are so small that it isn't necessary to treat them as you have the other pieces. Just sandpaper the rough edges and all sharp corners.

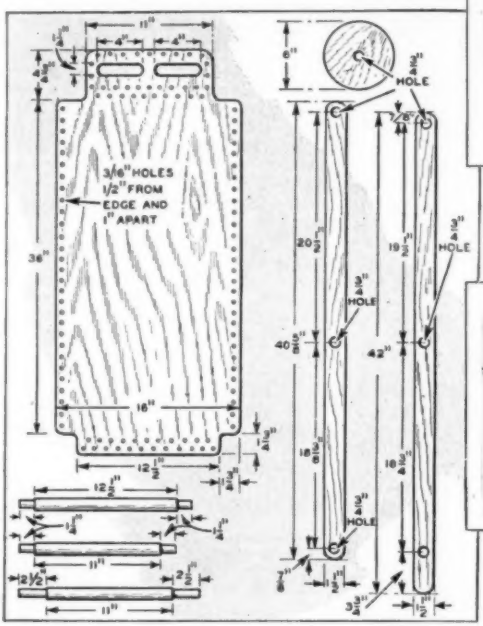
The axle and spacers should fit in the holes in legs snugly enough to be necessary to tap them lightly with a mallet. If they don't, use a little glue to prevent wobbliness. After you have the spacers and axle in place bore 3/16" holes through the ends of both legs and spacers. Drive in these holes 3/16" wooden pegs. Let the pegs pro-

Old-Fashioned Tea Wagon

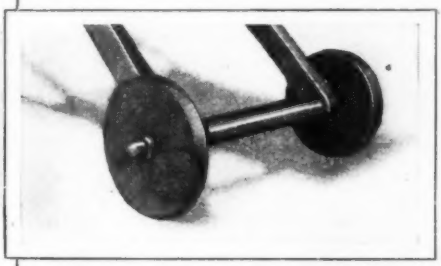
Here is the completed tea tray. For ridges on edge, cut with dimensions above. Ends of spacers, shown below, ⅛ in. A scroll saw may be used to round the edges.



In photo above is illustrated manner of lacing top to spacers on frame. Four rawhide laces are needed, and they must be drawn tight for best results. For originality you can figure out more decorative ways for lacing thongs.



All parts needed for construction of tea table are shown with dimensions above. Overall length of top is 36 in.



Wheels, cut from poplar or white pine, are held on the axle with leather washer and wooden pin. To give whittled-out appearance, chip out pieces of wood, with a drawing knife. Holes for the spacers are ¼-inch in diameter.

trude about ⅛" and round the ends of the pegs with a knife.

The wagon's top is lashed to the legs with rawhide laces. Four laces are needed and each lace is 72" long. The long ⅜" doweling that forms the ridge around the wagon's top is put on at this time.

Leather washers are put on both sides of the wheels, and pegs 3/16" in diameter and 1¼" long keep the wheels on the axle. Washers are also put on the outside of the center spacer and pegs 3/16" x 1¼" are used here.

When lacing the top to the legs do not cut off the ends of the laces after knotting them but make tassels as illustrated in the accompanying photo.

Give the wagon a coat of stain, Vandyke brown, fumed oak, mahogany or other dark stain. Leave the stain on for a short time and then wipe it off with a clean cloth.

Now comes the waxing and polishing. For polishing, mix bee's wax and benzine until the mixture is of a creamy consistency. Apply generously with a brush. Let this dry for two or three hours and then give the tea wagon a polish by rubbing it down with a clean cloth. It may be necessary to give the wagon two coats of wax.

The tea tray is made from 3 ply wood and is cut out with a scroll saw in the same way as the wagon's top. Next cut four dowels, two pieces 13½"x⅜", and two pieces 25"x⅜" in diameter. These pieces are then lashed to the bottom of the tray with 72" rawhide laces, as in the table top.

Real FUN WITH a Model

Is the hand method of launching model gliders becoming tedious? This article tells you how you can set your models to soaring from any height, limited only by the length of your kite string.

THUMBING over the pages of "Glider Flying," a brochure distributed in the interests of safe aviation by the United States Aviation Underwriters, I came across a timely article by Cy Caldwell. It was titled in glaring black type: "WHY DIE?".

"Why?" I asked myself, and started in to read the article. It proved to me that, without question, sooner or later I'd be pushing up daisies if I kept on experimenting and trying to fly my man-carrying contraptions.

I still wanted to build gliders—wanted to try out some new airfoil sections and see how different angles of incidence would improve the lift of the wings; so I hit on the idea of making a model glider circus and called in all the neighborhood kids to collaborate.

You see, these kids were well advanced in model building and the old hand launching methods had become pretty tame.

Well, we cogitated and thought some more and finally a fellow named "Vic" Duby up and said, "Let's build a good big kite and run our models up the string."

"By Gum! That's an idea worth trying," I answered, and down into the cellar workshop we went. A successful model circus was the outcome. Here is how it was made:

The Kite

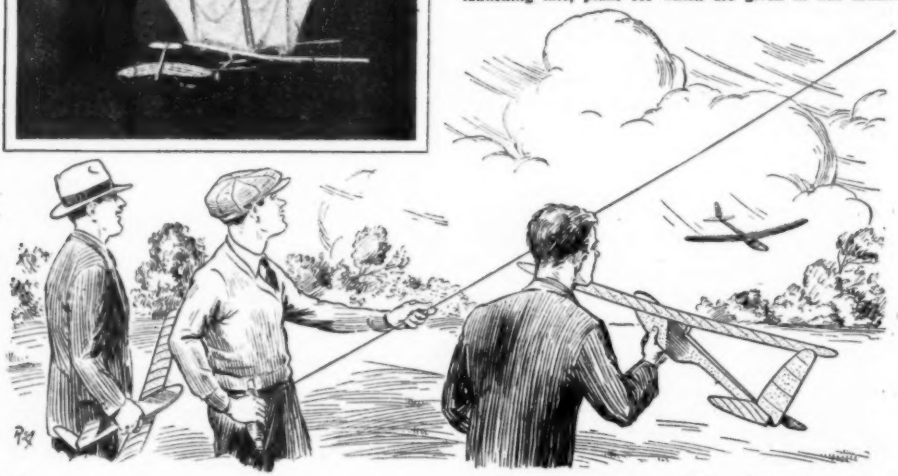
We selected a kite of the Eddie Box Type because of its known merit as a steady weight lifter. I'll tell you how to build it.

Four spruce kite-sticks are required. They should be six feet long and at least ½"x½" square to withstand the strain imposed on the kite by a heavy wind. Unbleached muslin, or even old bed-sheets, form the covering.

The top flying plane of the kite presents the main lifting surface, as it is provided with two triangular side wings extending from a cross-stick. The ends of this cross-stick slip into cloth pockets sewed on the cloth covering at the points of the triangular side wings.

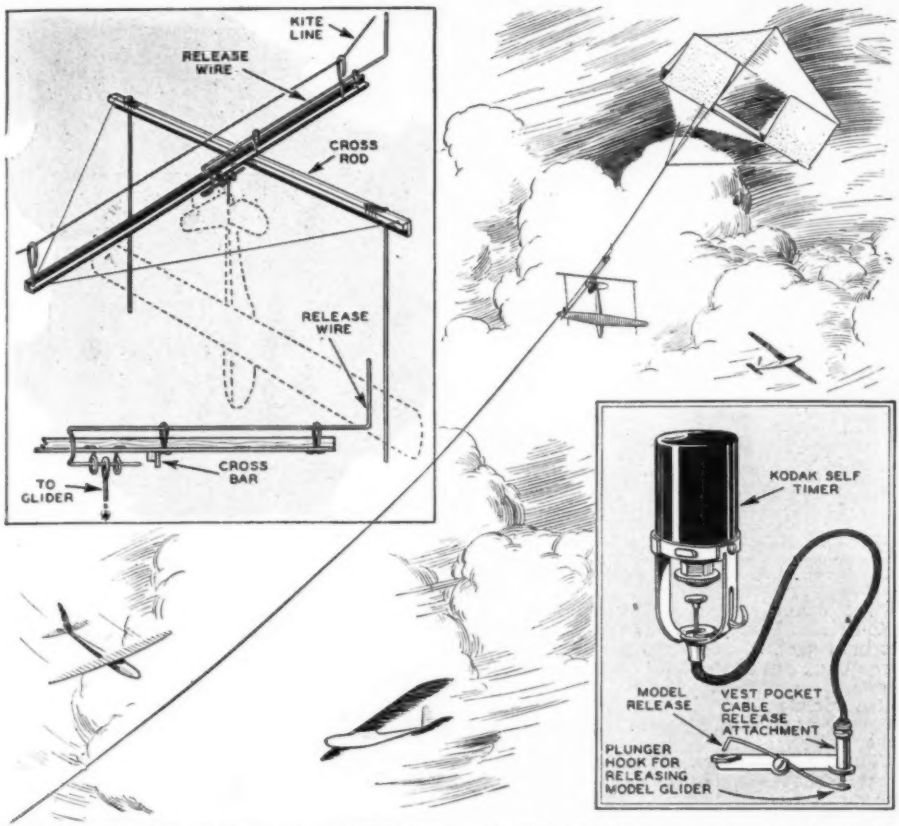
Two methods can be employed to hold the upright kite-sticks in place against the cloth covering. One method is to sew the kite-sticks in place with common wrapping string using a large needle. The other method is to fold the cloth covering at positions of kite-sticks so that when sewed the sticks can be slipped in place from the top.

The photo at the left shows "Vic" Duby and his model-launching kite, plans for which are given in this article.



GLIDER CIRCUS

by LIEUTENANT H. A. REYNOLDS



The detail drawings here show how the launching carriage and the Kodak self-timer are constructed. To attach the delayed time release to the kite, simply secure it with string wrapped around the self-timer and tie it securely to the halter of your kite-string at the center of gravity. Do not fasten this release directly to the kite, as it will impede flying.

When the job of kite making is really undertaken it will be found comparatively simple to cut and sew the covering. One precaution is important; hem all free edges of the covering material as the flapping of the cloth in a stiff wind is sometimes terrific and the cloth is apt to fray.

When the kite is finished a bridle must be made of kite string so that it will assume a position in the air that will present the plane surfaces correctly to the breeze.

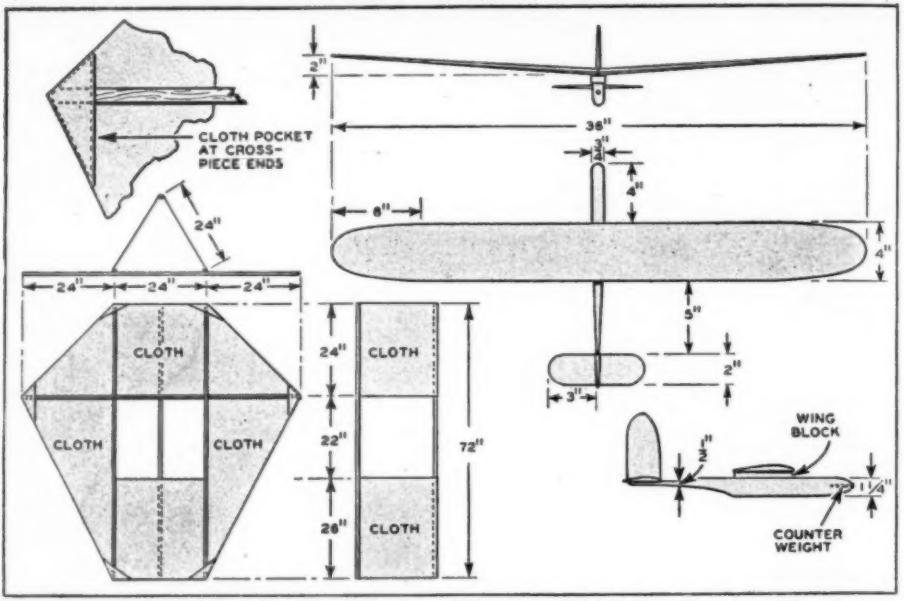
The Model Glider Carrier

The best bridle for this type of kite is to attach the upright string to the free-floating center stick and the horizontal string to each end of the cross-sticks. The lower section of the upright bridle string should be considerably longer than its upper portion at the knot where the horizontal string is tied to the kite-flying string.

The model glider carrier is a light frame which, when the model is attached, will be blown up the kite-string by the action of the wind on the wing and tail surfaces of the model; and when the kite is reached, it will release the model and slide back down the string to be used again in sending up another model plane.

A balsa stick ¼″x½″x16″ is used for the backbone of the carrier. Steel wire loops are placed at each end to act as slides for the kite-string. A second balsa stick ¼″x½″x12″ is fastened about six inches from one end of the first stick and serves as a cross piece. It is fitted with steel rods or split bamboo strips which point downwards extending for about ten inches so as to form guides to hold the model steady.

The trip-release is made by bending a long piece of steel wire so that it will slide in steel wire guides on the wooden backbone and extend far enough out in front



Above are given the dimensions for the model-launching kite and an efficient glider. Most fans will want to test out their own glider designs on the kite, and this can be done. These glider plans are chiefly for the beginner.

of the whole carrier to bump against the kite-bridle. It is then forced back, allowing its bent section underneath the carrier to slide back out of the loop on the tail of the model.

Simple steel-wire loops can be fashioned to serve as the little guides for the release-mechanism.

The model glider is hung up on a small steel loop, fastened to the tail of its fuselage, which is placed between two steel loops fastened to the underside of the carrier. The underside bend of the long release wire is slid through all three of these little steel loops, holding the model securely. The model's wings are now lying against the steel rods, or split bamboo strips, pointing downwards from the ends of the carrier cross-piece.

Slip the kite line through the open ends of the large wire loops on the carrier backbone and slide the whole unit as far along the line as possible. The wind will blow the model on up the kite-string, slowly sometimes—but surely, until it reaches the kite-bridle and the steel release wire is shoved back. Then the little steel loop on the model's tail slips off the release wire and the model will drop free.

Delayed Time Release

When a model is found too heavy to be blown up the kite string on the model carrier it can be released from the kite itself by means of a delayed timing device.

From your local Kodak store secure an Eastman Kodak Self Timer. (It will cost you $1.25.) At the same time you can purchase a No. 2 Kodak Cable Release and a Vest Pocket Cable Release Attachment. The Kodak Self Timer can be adjusted by simply turning the setting knob so that it will delay as long as ten minutes, or more, before the little plunger will thrust forward against the cable release.

The Vest Pocket Cable Release Attachment needs only the addition of a bent piece of wire to make a release hook for your model. The little cable is screwed into the threaded hole already provided on the attachment and one end of the bent wire is adjusted to come in contact with the cable plunger. The other end of the bent wire is shaped to form a hook on which to suspend the model glider. When the hook is forced open the model will slip off.

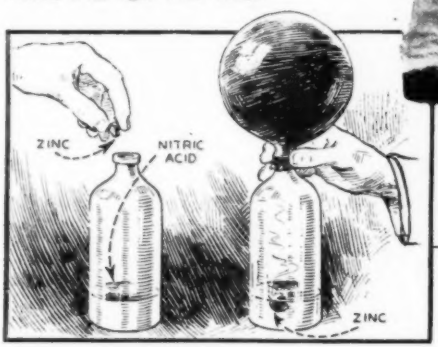
To attach the Delayed Time Release unit to the kite simply secure it with string wrapped around the Kodak Self Timer and tie it securely to the halter of your kite-string.

If the model is adjusted for proper gliding flight it may soar for a considerable length of time before landing. On one occasion a model, launched in this manner, was caught in a strong up-current and banked around in a tight circle, gaining altitude all the time, until it reached a position many feet above the kite from which it was released.

It has been found more satisfactory to adjust models, to be released from high altitudes, so that they will fly in circles.

Make These Floating Figures from Balloons

Comical human figure is made from balloons by assembling them as shown above. Rubber cement holds balloons together, while the arm joints are formed from tight twine bands.



To inflate balloons with hydrogen, hold them over neck of bottle containing nitric acid, into which has been dropped a small strip of pure zinc, as shown in the above drawing.

Top photo shows a grotesque dragon which you can make from six balloons. Face of the dragon is painted on a balloon with lacquer or enamel as shown below. Insert shows how to tie simple air-tight knot in neck of balloon.

BALLOONS have some surprising possibilities in the way of amusement. You can build fanciful animals or large comical human figures using only the various shaped balloons the venders sell, a small bottle of rubber cement, and a little patience.

To inflate the balloon with hydrogen, procure a large bottle, fill it with ten cents worth of nitric acid, and drop in a strip of pure zinc. Then hold the neck of the balloon over the neck of the bottle and in a few minutes the balloon will be raring to float off into the air.

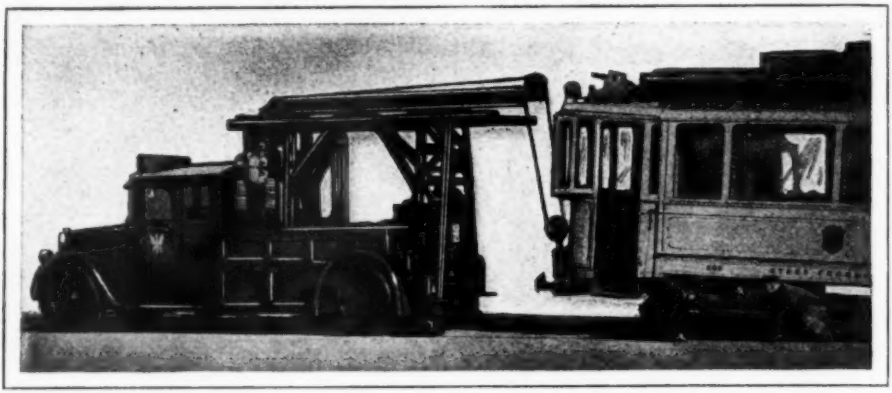
In the accompanying photo is shown the most effective method of putting a non-leaking knot in the balloon. Just make a loop, put the end through, and then pull tight.

A few balloons may be assembled into the figure of a human being, shown in the photos above, by holding the uncorked rubber cement bottle up against the balloon and letting the cement run against the rubber. The surfaces will stick very firmly after they have been held together for a minute or two.

Prepare the head of the figure by taking a moderate sized balloon and painting a humorous face on it with either lacquer or enamel, as demonstrated in the accompanying photo. Fingers of old rubber gloves cemented in the proper places make excellent noses, ears, fingers and toes.

If you want to make a dragon or a long snake, put together a string of round balloons, painting on the head some hideous face. Use a long, thin balloon for tail.

Boom on Emergency Repair Truck Lifts Trolley Wheels



Street car is lifted for repairs by emergency truck mounting the projecting boom supported by upright steel girders.

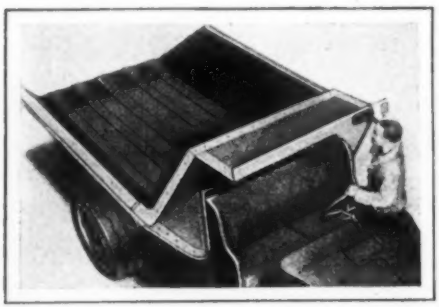
REPLACING the old fashioned jack formerly used for hoisting trolley wheels, a special truck has been devised which can be rushed to the scene of a breakdown to make repairs.

The car is lifted by means of a heavy boom extending out over the rear of the truck and to which is attached the block and tackle, as illustrated in the accompanying drawing.

Supporting this boom are two upright girders, which rest on the street when a repair job is being carried out.

Steel Shield Saves Driver's Head

PROTECTION of drivers on trucks at the gigantic Boulder Dam in Colorado is afforded by a special steel shield, three-eighths of an inch thick, which is built as a top over the driver's seat. Heretofore rocks had a disastrous way of bouncing down on the driver's head, an accident which is prevented by the shield.



Three-eighths inch steel hood over seat prevents rocks in load from bouncing down on driver's head, causing injury.

Oil Found Cause of Strange Fire

ONE OF strangest causes of fire on record was discovered recently when a pair of overalls hanging in a steel locker at a big electrical plant was found to be on fire. Nothing was found in the smouldering pockets except an almost clean bit of cloth.

This cloth proved to be the culprit. A little linseed oil which had been wiped on it had set itself afire during the night by absorption of oxygen resulting in chemical overheating. Any oily cloth put away in a badly ventilated place is likely to start fires by spontaneous combustion.

Testing Lung Power of Runners

TO TEST the lung power of athletes so as to get an estimate of the relation of the imput to output of energy, scientists have devised a special Douglas Cylinder. Mounted on a bicycle, as shown below, the device tests the metabolic activity of a runner when in motion.

Douglas Chamber for testing lung power of athlete is mounted on bike so that basal metabolism can be determined while runner is in action as shown in the photo above.

MOTOR MECHANICS

Edited by RAY F. KUNS

It's Time to Overhaul the Car

THIS article presents a rather thorough check-up on all parts of the car. Complete instructions for making the various repairs, however, are not given. Readers who have been following the articles in MODERN MECHANICS AND INVENTIONS over a period of months, will find many of the repair and service operations outlined in previous issues.

There is no better time than the spring time to stop and go through the entire list of car units, giving thought to maintenance service. It is not supposed that in all cases the car owner is going to do all of the suggested operations. Some may be done in the home garage and others in the neighborhood service station or car dealer's shop.

The Paint Job

The point of the article here is that if the motorist is to enjoy a season of trouble-free service from his motor car, someone needs to check it over rather completely to see that all is in order.

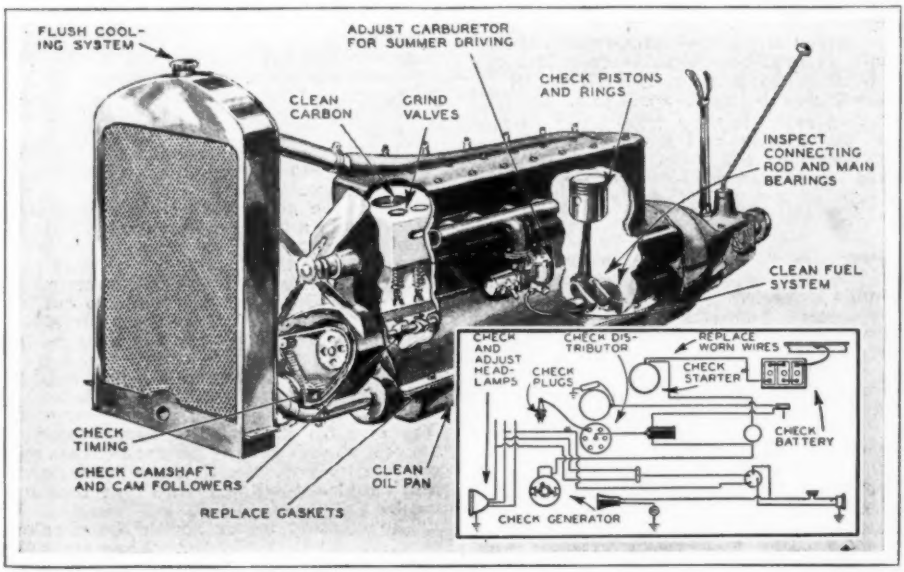
Paint, which in most cases is the pyroxylin lacquer, may be polished out to look like new. Spots which have been scraped or otherwise damaged, may be retouched. Nickel, chromium and other bright parts are polished. If the finish has been worn through from previous polishing operations have these parts repainted, re-nickeled or chromium-plated.

The Engine

Aside from the valve grinding and carbon cleaning job, which most owners see to regularly, there are many other things which may be of equal importance and just as readily done. Drop the oil pan, wash out all sludge and accumulation of carbon and other dirt.

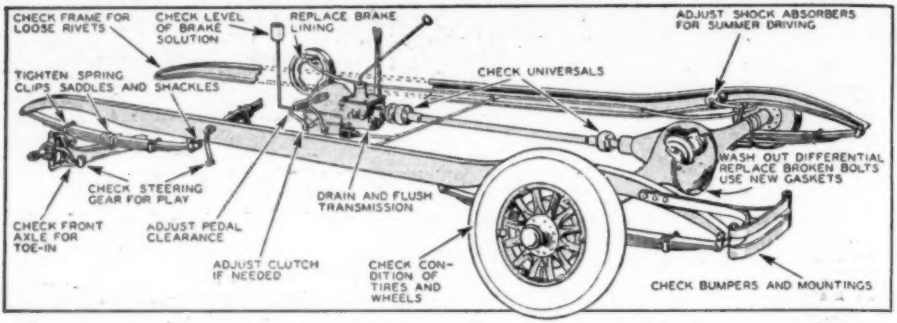
When the pan is down, inspect the connecting rod and main bearings. If there are bright spots or broken pieces of babbitt in the oil troughs or about the pan you may properly suspect bearing trouble. Inspect all bearing bolts for the condition of the cotter keys or other safety devices.

With the head off the engine, check the condition of the pistons and rings. If no scoring is evident, then look for ring wear which is evidenced by shoulders left at the top and bottom of ring travel. It is possible to make use of a cylinder gauge, showing taper and out-of-round without



When overhauling the engine and electrical system, the points indicated on these two drawings should be checked.

An Annual Overhaul Is Necessary if You Expect Trouble-Free Service


CHECK FRAME FOR LOOSE RIVETS
CHECK LEVEL OF BRAKE SOLUTION
REPLACE BRAKE LINING
ADJUST SHOCK ABSORBERS FOR SUMMER DRIVING
TIGHTEN SPRING CLIPS SADDLES AND SHACKLES
CHECK UNIVERSALS
WASH OUT DIFFERENTIAL REPLACE BROKEN BOLTS USE NEW GASKETS
CHECK STEERING GEAR FOR PLAY
DRAIN AND FLUSH TRANSMISSION
CHECK FRONT AXLE FOR TOE-IN
ADJUST PEDAL CLEARANCE
ADJUST CLUTCH IF NEEDED
CHECK CONDITION OF TIRES AND WHEELS
CHECK BUMPERS AND MOUNTINGS

Here are the points to be checked when overhauling the chassis and transmission. Hydraulic brakes are shown here.

removing pistons. If oil consumption has been unduly high, cylinder reconditioning, new rings, new pistons and pins are indicated.

Cams and Followers

Check the condition of the camshaft and cam followers. This is readily done from the bottom of the engine. Broken cam followers should be removed. Scored cams should be looked for. Camshaft bearings, as a rule, are not troublesome. If end play is found in the camshaft, check for the device used to remove it. The same can be said for the end play in the crankshaft, which ordinarily should not exceed .015″. This is removed by replacing the thrust bearing or removing shims at the forward end of the shaft.

Check the engine time, especially if the engine has been sluggish. The timing chain may have jumped one tooth or more on the sprockets. Inspect the chain for broken links and undue play. If the chain is of the adjustable type it ought to have approximately ½ inch sag at the longest run between sprockets.

When replacing the crank case oil pan, use new gaskets and see that the proper grade of new oil is used. If an oil filter is in use, this would be a splendid time to remove it and install a new filter cartridge.

The Cooling System

Flush the cooling system, using any one of the special radiator cleaning compounds to remove the scale and clean out the system properly for hard summer driving. In case the radiator and cooling system show signs of accumulation of oil or grease in the radiator, use a gallon of kerosene, mixed with water, to fill the radiator and heat it by running the engine. Draining this will remove the grease accumulation.

Clean the fuel system by removing all dirt traps and screens. Blow out the fuel lines so as to be sure they are clear. Check over the fuel supply system which is usually either pump or vacuum tank. It is a good plan to drain the supply tank, thus removing a lot of sediment and oftentimes troublesome water accumulations. Adjust the carburetor for summer time use.

The Electrical System

See that the ends or contacts of the wires are all in good condition, free of corrosion and snug. Remove and replace with new ones, any wires which show cracking or are badly worn. See that the wires are held in position so as to prevent damage.

Check the battery for electrolyte level, state of charge and for corrosion of the battery leads. Corrosion may be removed by means of a solution of baking soda and water.

Check the distributor for wear in the shaft and for a proper primary electrical ground. Check up on the contact point gap. Usually this is .018″ to .022″. See that the contacts are free of pitting. Polish them on an oil stone if pitted. If double contact points are used, see that they are properly synchronized.

Check up on the spark plugs to see whether the electrodes or wires are badly burned. Set the gap to car specifications or .022″ to .027″. If spark plugs are sooted badly, try a longer porcelain. If the porcelains are burned, try a plug with a shorter porcelain.

Check the generator. If this is driven by means of a belt, see that the belt adjustment is correct. The spring is a good time to have the generator charging rate set back. See that the commutator is smooth. If the generator tends to cut out at high speeds, it is likely the commutator should be turned. Check the brushes for length. If they are worn quite short, have them replaced before the brush holders strike the commutator.

Naturally you are going to remove the dirt and oil around the commutator to prevent the oil getting on the brushes and starting trouble. See that the generator is lubricated according to the type bearings used.

The starting motor should be checked over, seeing that all connections are tight and the commutator and brushes free of

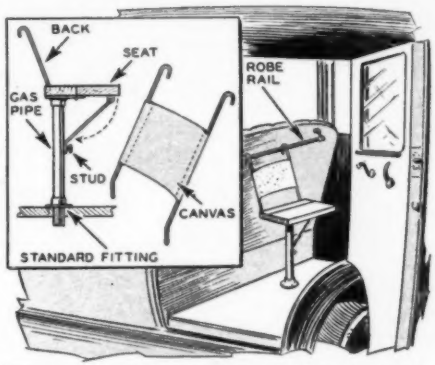
(Continued on page 180)

Handy Emergency Seat That Folds Up When Not in Use

THIS handy extra seat for a five-passenger car can be folded up and placed under the seat when not in use.

It is made from a piece of gas pipe with a standard fitting at each end. The lower fitting is screwed well up on the pipe, leaving several inches of pipe below it. This extension goes through a hole in the floor and helps keep the seat upright.

The top fitting is fastened to the wooden seat by means of screws. This seat is hinged and folds down as indicated on the drawing. Two rods, hooked over the robe rail, support the back.



Above are shown the simple construction details of a handy emergency seat for a 5-passenger car. Dimensions are not given as they will vary with different makes of cars.

Grinding Valves With Rubber

The rubber valve grinder is revolved between the hands.

ONE of the latest tools for motor mechanics, formerly made of high tempered steel, now consists of rubber. Both ends can be used for grinding valves in motors.

Each end has a soft suction rubber cup. Valve grinding compound is placed in the cup and revolved with the hands as illustrated.

Don't Let the Top Deteriorate

DRY rot sets in about the wood of the ordinary closed car top after one, two or three years. Ordinarily the length of time is not so important as whether or not the wood within the top construction is being kept dry.

In order to insure that it is kept dry, make certain that the top covering does not deteriorate to an extent where moisture is permitted to seep through. Treat the top with proper top dressing or wax. The wax will keep the moisture out.

Making a Gear Reduction Drive

THERE are many places about the home workshop and the experimental laboratory where the problem of a satisfactory gear reduction is hard to solve.

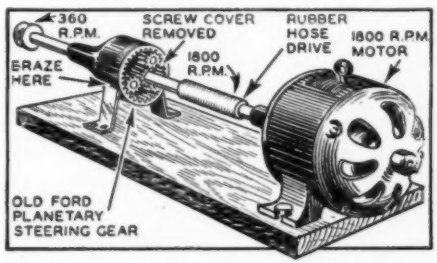
By making use of the planetary gear set used on the upper end of the old Model T Ford steering gear, a gear reduction of either four to one or five to one, depending on the date of manufacture and car model, may be secured.

The parts may be purchased from the dealer or salvaged from an old car. It will be necessary to start building up the reduction gear set by placing and fastening the "sun" gear. This must be rigidly bolted to a plate or other mounting.

Next cut the shaft carrying the three planet gears and their pins, to the length desired. This will project through and carry a pulley, usually.

The steering wheel which fits on the stub shaft is replaced with a fitting to hook the stub shaft to the motor shaft directly or by means of a pulley. The cover (not shown) acts as a bearing for the stub shaft.

When the job is completed it is packed with cup grease and will give long service if not overloaded.



This drawing shows the details for making a gear reduction drive from a Model T Ford planetary steering gear. The cover which screws onto the sun gear acts as a bearing.

Old Musket Makes Upright

Fig. 1. The completed stand, having a muzzle loading musket as an upright, gives a distinctive atmosphere to a room. The old-fashioned gun need not be mutilated.

Fig. 2. The upright braces which support the musket are made from 3/16x½ in. bar iron and curved to create graceful appearance, as illustrated in the photograph above.

REMINISCENT of historic battles or exciting moments of the chase, is this electric floor lamp, the principal part of which is an old-fashioned, muzzle-loading musket a century old.

Perhaps you have, among the family antiques, a gun that can be converted into such a lamp; or you can obtain one without a great deal of trouble. If so, you will find it an easy task to mount the firearm on a suitable base, and equip it with sockets, cord and shade.

In building such a lamp, first construct a suitable base. The design shown in the accompanying drawing is but one of many. It consists merely of four pieces of 1¼ x 3 in. walnut arranged in a lattice fashion.

The best way is to cut four pieces each 15 in. long, and arrange them in pairs at right angles to each other, with parallel pieces 3 in. apart as illustrated in Fig. 3.

In order to give the wood an ancient appearance, treat it somewhat roughly as follows: With a sharp hatchet and a wide chisel, hew the portions of the sides and top that will be visible, and round the edges and corners. Strive to give the blocks the appearance of having been cut from the original log by hand.

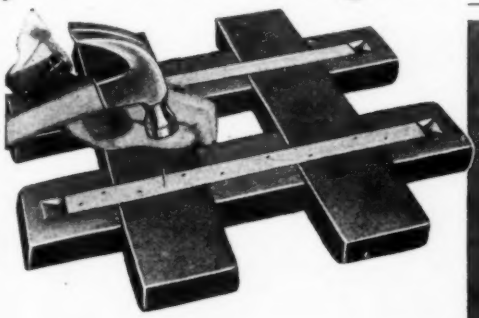
Scorched Wood Gives Antique Look

Then, with a blowtorch or gas flame, scorch the surface evenly, but not too deeply. This rounds off all sharp edges in addition to darkening the wood.

Remove charred wood with a stiff brush, a flexible wire one being best. Then, with fine sandpaper, highlight the raised parts. Finally apply two or more coats of good floor wax, allowing each application to dry for at least an hour. Finally, polish well with a scrub brush or similar tool.

Upon inspection of the gun you will find several places where bolts or screws can be used for fastening braces. One of these probably will be at the rear end of the barrel and another will be in the butt.

for this Novel Floor Lamp



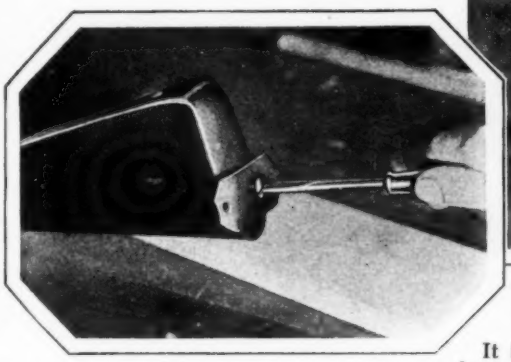


Fig. 3. Top photo shows how the cross pieces for base are assembled. Pieces are mortised at points where they cross. Photo below shows how butt plate is secured in place.

Fig. 4. The multi-socket fixture is fitted into the muzzle, as shown, and held tightly with flannel packing. Wire follows outside barrel to base.

Stand the gun on the base, with the barrel on a vertical center line, and determine the length and shape of the braces you will need. Three upright braces as shown in Fig. 2, together with a small plate fastened to the butt, will suffice.

For the plate, obtain a piece of heavy sheet iron—it doesn't matter if it is a bit rusty—about 1½ x 4 in. in size. Curl the corners, and drill three holes, one near each end and one in the center.

Securing Gun Butt to Base

The middle hole should be of such size that the screw that holds the butt plate of the gun will pass through. The other two holes are to receive wood screws that anchor the rectangular plate to the base. (See Fig. 3.)

Upright braces are made from 3/16 x ½ in. bar iron, and are curved to create a graceful appearance as illustrated in Fig. 2.

Before bending the iron, hammer it liberally on both sides and edges with a ball-pein hammer. This provides an interesting surface. Bend the iron, while cold, with the aid of hammer, anvil and vise, and drill the mounting holes.

It is best to attach the center or main brace to the gun by means of the heavy bolt at the breach, and then fasten the remaining lateral braces to the main one, using either a rivet or a small stove bolt passing through all pieces.

Of course, you may have to alter these directions if your gun is built differently.

If you do not object to drilling a hole into the gun barrel near the rear—now bottom—end, you can run the lamp cord inside the barrel to the multi-socket attachment at the muzzle end.

Socket Fixture Fits in Muzzle

With the lamp shown in the accompanying photos, it was desired not to mar the gun. So the cord was run through the two sling swivels along the barrel, and into the two-socket fixture through a drilled hole in the side. (Fig. 4 illustrates this.)

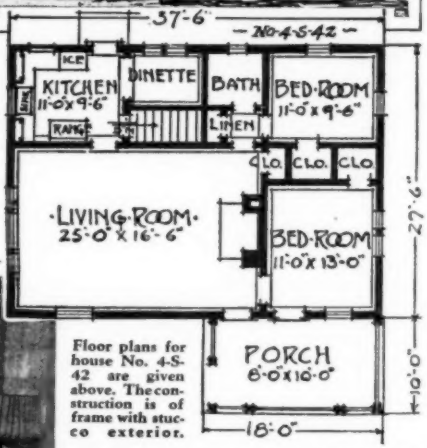
The tubular portion of the socket support is of such size that, with a bit of flannel for packing, it could be forced tightly into the muzzle. Pull-chain sockets are used.

Before assembling the lamp, give all parts, including the gun, if you wish, one or two coats of good floor wax, and polish to prevent tarnishing.

In obtaining a shade, select something that will harmonize with the general scheme of the lamp.

WHERE Your Money Goes

This five-room house, built from plan No. 4-S-42, is featured by an open porch and a studio living room. In addition there are two bedrooms, kitchen, dinette, bathroom.



Floor plans for house No. 4-S-42 are given above. The construction is of frame with stucco exterior.

Saving money on home building is chiefly a matter of careful planning and of having a thorough knowledge of the job. Here Mr. Flagg gives you some money-saving advice on the subject.

All-wood interiors of knotty pine in natural finish are becoming popular.

WHEN asked how long a man's legs should be, Abraham Lincoln replied: "Long enough to reach the ground."

It's so with money spent for a new house. You've got to have enough to finish the job. You don't want to spend a penny more than necessary. For many planning a new house it is difficult to visualize where money goes and what it buys. Therefore long in advance of letting a contract, it's advisable to make out a buying schedule or list of quantities, obtain prices on materials and equipment and establish a per dollar cost for the trades you must employ.

All of which may sound technical and business-like, but by so doing you may be able to save considerable money because with such a "time table" you may find you can cut here and prune there and thus arrive at your destination quicker and at less expense than if you trust to luck and build by rule of thumb.

When BUILDING

by MAURICE I. FLAGG

HOW TO GET A BLUE PRINT AND TWO PLAN BOOKS

A one-sheet blue print of any house appearing in Modern Mechanics and Inventions magazine may be had for $1.00, postage prepaid. Two new plan books, "Homes for Newlyweds," containing 32 of the latest ideas for low cost homes in all styles, and "16 Selected Homes for Lean Purses" containing time, space, and labor-saving bungalows, may be had for 15 cents each, or both books for 25 cents, postage prepaid. Address Home Building Editor, Modern Mechanics and Inventions Magazine, Minneapolis, Minn.

House built from plan No. 4-S-43, having nineteen windows in all, is really one big sun porch. Blueprints for this house may be had by mailing $1.00 to Modern Mechanics and Inventions Home Building Editor, 529 South 7th St., Minneapolis, Minn.

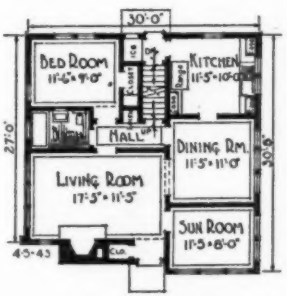
An ingenious scheme for saving space in modern homes is this roller bed which pushes back into the wall, appearing as if it were a part of a built-in buffet, as shown.

If you are intent on making your money buy the limit in value a good rule is to use middle grade materials which may be the equal in every way of the better materials but lack something in finish. That "something" is usually discernible only to the eye of an expert so your house will not suffer to any great extent in either appearance or service.

Spring home building is right around the corner. Thousands should take advantage of the best market conditions we have had in ten years.

I've said before and repeat again, *now is the time to build.* Your dollars will buy more and go further.

The two houses I have selected for this issue are spring building suggestions. Both are planned to offer style, reasonable cost, and several unusual features that set them apart from average small houses.



Note profusion of windows in floor plans for house No. 4-S-43, shown above.

Plan 4-S-42 features a porch as an exterior detail. The porch, back in horse and buggy days, was much like a grand stand. Here the family gathered on warm summer nights and after Sunday dinners for rest, gossip, a swing in the hammock and to watch the parade go by.

As automobiles increased in number and became more like traveling porches, fewer porches were built on houses. Families that watched the parade go by, joined it.

The old fashioned porch did not exactly vanish but in new houses it blossomed forth as a sun parlor enclosed by glass and hardly big enough for two people.

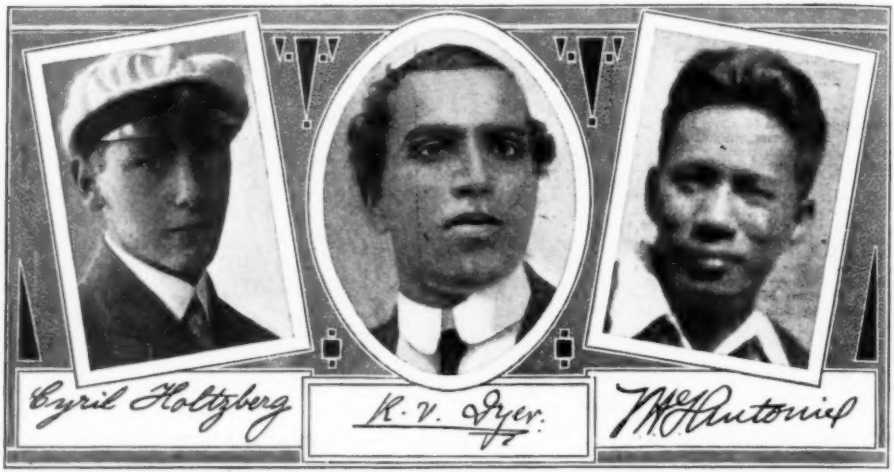
Something strange is happening, however. The porch is coming back in favor. Perhaps one reason is because highways and byways are so jammed with week-end traffic that folks are finding out how delightful it is to stay at home, and so there must be a roomy place to sit out of doors.

You not only have a generous open porch in Plan 4-S-42 but if you wish it can be glazed or enclosed to provide a weather proof living room during most of the year.

This house will appeal to many because of the studio living room, 25 by 16 feet, in one end of which is a fireplace. In addition there are two bedrooms, a kitchen, dinette and bathroom. There is a full basement

(Continued on page 172)

Your Handwriting Analyzed Free



M. N. Bunker, internationally famous grapho-analyst, from study of hand-writing has learned that human nature is pretty much the same the world over. Writing of Cyril Holtzberg, of Sweden, shows keen mentality and much pride. Self-reliance and tenacity of purpose are characteristics of K. V. Iyer, of India. W. H. G. Antonio, of Philippines, is keen, positive thinker. Send a specimen of your handwriting to M. N. Bunker, care of Modern Mechanics, and see what it shows.

ACCORDING to M. N. Bunker, internationally known grapho-analyst, Kipling sure told the truth when he wrote:

"There is neither border, nor breed
nor birth,
When two strong men stand face to
face,
Though they come from the ends of
the earth."

As proof of this he has gathered handwritings from every corner of the world, and in analyzing them has found that human nature is the same wherever you find it.

Analysis of Indian "Strong Man"

For instance here is a specimen written by a famous athlete and "strong man" of India, K. V. Iyer, who is shown in the photo above. His writing shows self-reliance, and capacity for positive ideas. When Mr. Iyer believes a thing he believes it all the way through.

He has tenacity, and possesses a brain that acts quickly, penetratingly, and at the same time analytically. He is careful about details, does each thing as it should be done, and when it should be done.

When Mr. Bunker told him this he said, "I should say your character reading is wonderful. I was astonished to note that you can so cleverly read one's character through his handwriting."

Character Told From Writing Only

Mr. Iyer has never been in the United States, and Mr. Bunker never saw him, but got the facts from letters written in India and sent to this country.

A signature from the Philippine Islands is also given above. Mr. Antonio, at the right, was born many hundreds of miles from the native land of Mr. Iyer. They grew up under different influences, and yet Mr. Antonio's writing also shows that he is a keen thinker.

He is positive in his ideas. He has judgment, and is self-reliant. He keeps secrets. He is very loyal to his ideals of right. He is careful and conservative rather than extravagant in either act or thought.

When he received his handwriting report Mr. Antonio said that every word of it was true, although all that Mr. Bunker could know of him was through his handwriting.

What Swedish Youth's Writing Showed

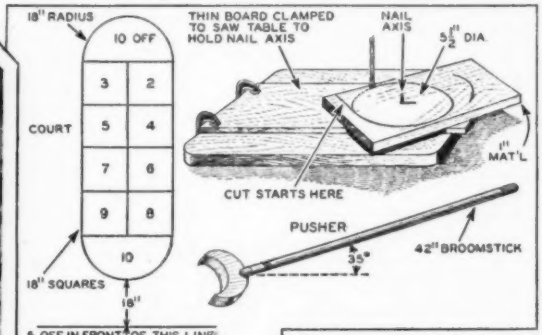
Then we have the writing of Cyril Holtzberg, of Sweden, who is shown at the left above. This young man also tells the story of his talents and character. He is careful and thrifty, but very warm-hearted. There are times when he becomes bitterly discouraged because of the strong emotions that rule him. He has a keen brain, and much personal pride.

So we have three handwritings from three widely separated parts of the world, but in each case these handwritings told the truth about the writers. This applies to the whole world, proving that regardless of race there is a human foundation that makes the whole world one.

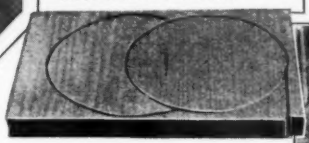
Your latent powers and talents, as revealed by your handwriting, will be analyzed for you free if you will send a stamped, self-addressed envelope, together with a specimen of your handwriting to M. N. Bunker, care of Modern Mechanics and Inventions, 529 So. 7th St., Minneapolis, Minn.

Play SHUFFLEBOARD on Your Sidewalk

The player takes a position at the starting line in preparation for the shot as demonstrated above. Skill is required to give just the proper force to the thrust.



Chalk court on walk with dimensions shown at left. At right is illustrated a method for cutting the discs with a bandsaw.



To make the discs scribe a 5½ inch circle on piece of hardwood as shown above. Half-moon which forms pusher is then cut from remaining portion of the board. Photo at right shows how the pusher is held by the player. The discs should be painted in different colors—red, green, orange or white — one for each player.

THE game of deck shuffleboard, so popular on ocean liners, can be adapted to the sidewalk, driveway or porch and will provide lively amusement.

Briefly, it consists of a numbered court chalked on the concrete and a set of discs and pushers.

Discs can easily be cut with a jig or bandsaw, with the scheme shown in the drawing. This is a nail in a thin board around which the disc revolves when being sawed to a circle.

Use about one inch material, preferably hardwood, and cut from rectangular pieces so that the pusher crotch can be cut from the waste end and thus fit the disc perfectly.

For handles use broomsticks set at about a 35-degree angle. Paint the discs different colors, red, orange, green and white, one for each player, and paint bands on the pusher handles to match.

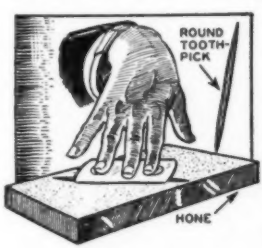
Rules for Playing the Game

Chalk the court on the walk according to the diagram above.

Players can pair off as partners, taking alternate turns. The object is, of course, to get the highest score, which is recorded after all players have had one turn, and the first to get fifty points wins.

Players of course endeavor to leave their discs in the highest numbered square, but the following player, if an expert shot, will be able to knock out the disc of his predecessor and leave his own in the high square.

Discs resting on lines do not score, and 5 is deducted from any player whose disc comes to rest in front of the line indicated, with 10 off if it rests in the extreme semicircle.



Tooth Pick Makes Roller to Sharpen Razor Blades

THERE'S no excuse whatever for throwing away old safety razor blades which have lost their edge, for with the method illustrated in the accompanying drawing you can quickly and easily whet them back into form again. All you'll need is a round tooth pick and a little elbow grease. The dull blade is rested on the tooth pick so that it meets the hone at an acute angle, as demonstrated. Pressure is applied with the fingers, the blade being moved back and forth on the stone. Keep up this motion till you're satisfied with the edge.

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Will Grow Your Hair Or Cost Nothing

After: Jack Slavin At 65

Before: Jack Slavin At 45

You all know Jack Slavin, formerly Middleweight Champion Boxer of Australia and America. He's now 65, but when he was 45 he was bald. See untouched photos at sides.

When he was touring Asia the Sultan of Johore introduced him to a Hindu Prince who, in jest, attempted to pull the few straggling hairs that remained at his temples. Jack was angry, and to appease his anger the Prince handed him a formula, saying: "Here, this will grow your d.... hair." Imagine his delight when it DID.

He has used this formula and treatment for 17 years with success on thousands of bald heads.

It is guaranteed to grow hair on your head, stop falling hair, eliminate dandruff and relieve itching scalp, or your money will be refunded—every cent of it.

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The NEW HOW-TO-BUILD-IT BOOK — NOW ON SALE.

Where Television Stands Today

(Continued from page 46)

vision has advanced, it still labors under many serious difficulties. Chief among these are a lack of definition (poor detail) and brilliancy.

With the few lines now utilized the images do not receive a thorough scanning, particularly where scenes covering a wide area are involved. Increasing the number of lines will bring clearer pictures, making it possible to televise such spectacular events as football games and boxing matches.

For images lacking brilliancy, insufficient signal strength, and particularly, the present inadequacies of the neon lamps now available are largely responsible. Television will not arrive at perfection until a lamp is developed which can respond brilliantly to weak signal currents.

When engineers have vanquished the difficulty of perfect synchronization they will have made a noteworthy advance. When the scanning disc of the receiver gets out of step with the transmitter, strange things happen to the televised picture. As illustrated in an accompanying drawing, the image rises and falls on the screen, sways from one side to the other, or shifts dizzily back and forth till it becomes unrecognizable.

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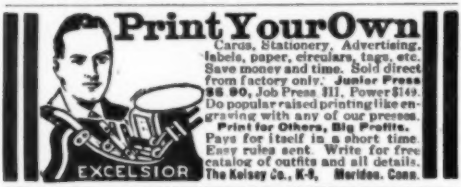

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Agents net up to $30 a day. Mr. Earl Smith made $89 in 8 hours.
Wisconsin Abrasive Co., Dept. 7084, Station A, Milwaukee, Wis.

Where Your Building Dollar Goes

(Continued from page 167)

but in warm climates the house can be built without a cellar. Furthermore the house can be placed on a lot with the novel studio window toward the front. The construction is frame with stucco exterior, although the exterior will look well if done in shingles or siding.

What about the cost? Costs vary depending upon equipment and location but this house is in the $5,000 price range, possibly less, due to present market conditions.

If you have $15,000 to spend in building a home—or if you ever hope to have—the following table shows how the building dollar should be spent to get the best value. The same approximation of cents-on-the-dollar for each item of construction will apply to houses costing less than $15,000 or more.

The figures below covered a recent detailed investigation of the cost of building nine houses averaging $15,000.

	Cents spent.	Total in $15,000 house
For excavating and grading	1.8	$ 270
For masonry	9.4	1,410
For stucco, plaster and tile work	10.6	1,590
For carpentry	27.2	4,080
For roofing	5.4	810
For flashings, downspouts and gutters	0.7	105
For plumbing	9.3	1,395
For heating	7.0	1,050
For electric wiring and fixtures	2.7	405
For hardware	2.0	300
For painting and glazing	4.5	675
For screens	0.9	135
For landscaping	3.0	450
For builder's profit	9.4	1,410
For architect's fee	4.5	675
For financing	1.6	240
Total	100.00	$15,000

Plan 4-S-43 is really one big enclosed sunroom or porch. There are nineteen windows on the first floor, making it almost a glass house. The style is English adapted to modern American living conditions.

The first floor provides complete bungalow service and if you are bent on saving money the two bedrooms on the second floor can be finished later.

It is a house that can be adapted to any building conditions, stucco, brick, brick veneer, hollow tile or frame—take your choice. The half timbering, done with unplaned planks, is inexpensive and with the added dash of the gateway arch at the left, lends that distinctive touch that makes it the "different" house in any block. Roof may be done in variegated shingles or one of the composition roofings that give the same effect.

What's more, the house looks a lot larger and more expensive than it really is. There's plenty of style and your money spent for a house of this type will buy excellent resale value.

The cost will depend upon where and how you build. Perhaps $6500 in some localities. Maybe more and maybe less, depending as I have said, upon materials and equipment.

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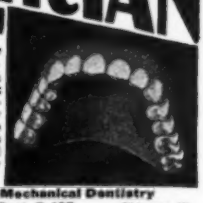

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Collapsible Pontoon Boat

(Continued from page 149)

proximately as shown. Next, metal eyelets are fitted along the edge and the tubular casing is finished.

The next operation is to sew on the bottom and the seats. This offers no difficulties. The illustrations are self-explanatory, but it is well to mention that the front edges of the seats are hemmed to permit the entry of 18″ bamboo sticks. The hems must be left open at the ends to permit removal of the sticks when the boat is folded up.

A rigid flooring, while not absolutely essential to the navigation of the boat, is advantageous to the fly or bait caster who may wish to stand up to cast. A style of flooring which will answer the purpose very well is shown. It is exceptionally light and compact when dismantled. It is made of half-section lengths of bamboo. The cross pieces are drilled so that the flooring can be laced together with light-weight sash cord. To prevent the bamboo from splitting, it is suggested that split corks of suitable size be placed at intervals in the hollow and wrapped with wire.

The boat herewith described is designed for propulsion with oars, but paddles can be used instead, at the option of the builder.

Attaching the Paddle

The sketch is practically self explanatory, but I shall direct attention to the manner of attaching the paddle. The bamboo is split and the paddle inserted. Small holes in the paddle permit wrapping the bamboo with copper wire. About 24 gauge is recommended. The wrapping should be very tight and afterward covered with solder. A light, strong, permanent oar results, 1¼″ ferrules may be difficult to buy, unless one lives near a sporting goods store that caters to salt water fishermen. In case they can not be bought locally, a sheet-metal worker can make them of hard drawn brass or of "Monel" metal.

We now come to the last, and very essential, requisite of the pontoon boat—the tube. It is not necessary to buy new tubes for this use, but it is very important that the tubes used be of good, live rubber. Selected sections of used tubes can be joined together to form the one, big tube. A properly vulcanized joint is best, but if a vulcanizing shop is not equipped with a special mold so as to make the joint in one "cooking," then a cemented job is preferable.

First, a split sleeve must be made of fairly heavy sheet metal stock. Note particularly the construction of the seam. The diameter of the sleeve should be about ½″ larger than the tubes to be united.

One end of the tube to be joined is drawn through the sleeve and then folded back over the outside of the sleeve. Next it is folded back over itself for about 2″. Then the end of the other tube is stretched over the opposite end of the sleeve and turned back over itself for 2″.

Thoroughly clean the folded back sections of the tubes with gasoline, and roughen the surfaces with wire brush or coarse sand-paper. Apply two coats of cement, allowing 15-minute intervals between applications. When the last coat has become properly "tacky," roll the second fold over

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Collapsible Pontoon Boat

the first fold and press firmly together. Let stand for 15 minutes or longer. Then the folds of the tube can be removed from the sleeve, the sleeve opened at the seam, and the tube removed through this opening.

After enough sections have been joined to make an endless tube of proper length, it is placed in the canvas casing, the casing laced, and the tube inflated. Of course, one section of the joined tube should contain a tire valve stem, light sash cord or a carpenter's chalk-line makes a very good lacing.

After the tube is inflated, the boat acquires a remarkable rigidity. But small wrinkles and irregularities in the canvas may show up. In fact, the pattern of the tube casing itself is not absolutely mathematically correct. But any small irregularities will disappear after the canvas has been shrunk. While the boat is tautly inflated, hose it all over and permit it to dry out in the sun. Repeat the operation four or five times. The canvas casing should then be free of all wrinkles.

Next, the canvas must be water-proofed. A number of good preparations are available on the market, but the writer has found that a gasoline-paraffin mixture serves the purpose satisfactorily. This mixture is made of mixing 2 pounds of metal paraffin with one gallon of warm gasoline. The mixture can be applied with any kind of a large brush, or even with a whisk-broom. Several coats should be applied along sewn seams, particularly on the bottom.

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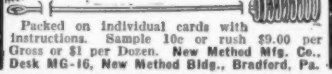

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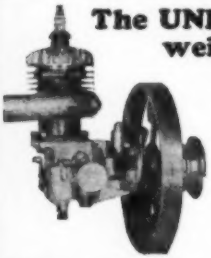

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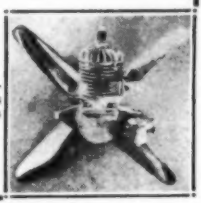

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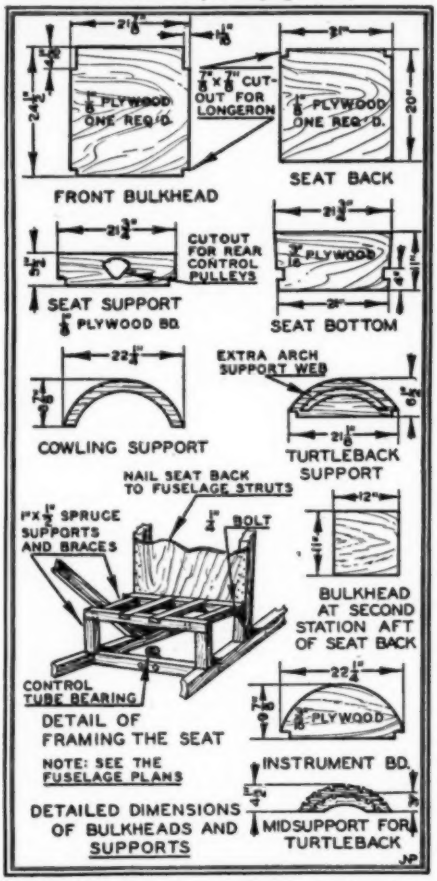
Plans for the Pietenpol Sky Scout

(Continued from page 131)



Dimensioned drawings for miscellaneous fuselage fittings.

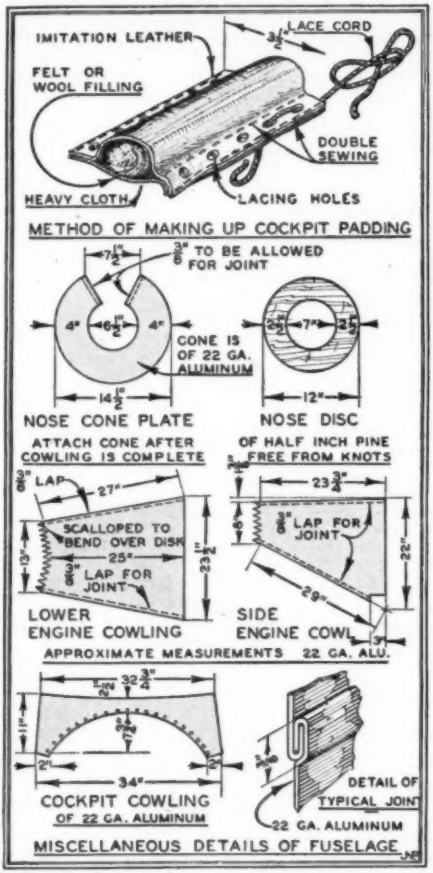
then do the same with first side you started.

Now take the two sides and clamp them together. Saw off ends of the longerons exactly the same length. Take a tri-square and mark off all strut stations, the place for the instrument boards, and a few extra marks that will come in handy to measure from.

Now make the seat back and the front bulkhead. (These must be perfect, as the whole job depends on them) and nail and glue them in place. You may now put in the ¼"x5-plywood floor nailing it in with 1 inch 17 gauge nails. Next comes the top of the fuselage.

Now pull the tail end of longerons together, make this joint fit good, glue and nail it good, and put in all the rest of struts and braces, using the center line method to get it straight. That is, make a line in the center of each strut and make a tight string or wire pass over this line when drawn from center of front to center of tail post.

Plans for the Pietenpol Sky Scout



Detailed drawings of the seat and bulkhead construction.

The struts are next set on the gusset plates of the sides. Then put on turtle back, instrument board, cowling, and support and the woodwork is finished except for seat, which you should have no trouble with.

I can get the fuselage built up for you if this sounds like too much work, and then you will have a perfect job around which to build the rest of the ship.

The Wing

The fittings are so clear on the plans that it would be a waste of time to say anything about them. They are all made of regular 1025 aircraft steel and are more than strong enough.

The wing on the Sky Scout is much too strong and could be lightened a little. It weighs about 90 pounds complete. It was only built this heavy because all the regular parts to build the Air Camper wing were used.

I wish to call your attention to the brace right back of the rear beam. This was changed from the plans of the Air Camper, and I advise all

(Continued on page 178)

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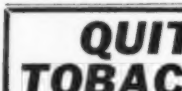

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Plans for the Pietenpol Sky Scout

(Continued from page 177)

of you who have not built up your wing ribs to build them this way.

After your ribs are finished make your beams, (if you have trouble doing this, we will be able to make them for you) and splice them in the center. Now mark off all places where the ribs will come, having the two beams clamped together.

A good way to do this is to mark off the places on half of the spars, then reverse one beam and mark the other half from the first marks. You will then know that it is right.

Next glue in the piece of 3/32" or ⅛" plywood that is set beneath the gas tank, and be sure you have this in the center and perfectly square, as the whole wing is lined from this center. Now put on all the ribs and glue and nail them with two 1"x17 gauge nails at each joint. On the top it will be found necessary to put in small spruce blocks to fill up the gap. These must be glued on both sides.

Next put on all wing fittings and brace wires (We use 3/32" cable as it is easier to handle, although No. 12 hard wire is O. K.) and line the wing up with the wires. Do not make them too tight until you get in your compression struts and wing tips.

Now put on leading edge, trailing edge, aileron beams, flop beams, and wing tips in order named. Line the wing up so that it is perfectly straight and put in all braces in wing (wood) and also put the ½"x¼" braces on the ailerons and put all filler strips on the aileron hinges (which are only small strap hinges with a new pin put in which has a cotter pin hole in its end.)

Now place the control horns, and you are ready to cut the ailerons and center flop from the wing. By leaving all the ribs full length and cutting the ailerons and flop free when finished you are sure to get a better and straighter wing. After you have all the parts finished and sanded you may give the whole thing a coat of varnish.

Next month we will take up the tail surfaces, landing gear, controls, covering, and assembly; while the third and final installment will cover the simple motor conversion for the Ford Model T engine.

Navy's Scientists Build Industries

(Continued from page 80)

peacetime contribution of the navy to the American people.

If we step aboard one of the latest ocean liners for a voyage to the Pacific Coast, we will soon find ourselves cruising in a ship that is speedy, economical to operate, and virtually free from machinery vibration.

Most fast ships are plagued with vibration, but these new ships are practically vibrationless because they are the first commercial ships to take advantage of the electrical driving machinery developed by the navy for the propulsion of battleships.

Some years ago the navy found that the jolting, jouncing, vibrating, reciprocating machinery com-

monly used in ships had a bad effect upon the accuracy of naval gunnery, and sought to develop something better. They experimented with the electric drive—steam turbines driving huge dynamos, and the dynamos supplying the power for electric motors that turn the propellers.

Such developments made by the navy are always the property of the American people, and merchant shipping firms having recognized the advantages of electrically-driven ships have now given us the electrically-driven passenger liner.

No phase of naval activity is so closely lined with the march of progress in industry as is naval aviation. From the time of the first flights by the Wright Brothers, 27 years ago, the navy has been actively interested in aviation.

As early as 1912 the navy established the first aerodynamical laboratory at the Washington navy yard. This laboratory also included the first wind tunnel in which so much of the coordination between theory and practice has been worked out to the untold benefit of aviation.

To the navy also goes most of the credit for the development of the seaplane, the amphibian, vastly increased efficiency in airplane design, dependable motors, and the creation of the catapult for launching airplanes from the decks of ships.

Several large steamship firms are now definitely considering the use of the catapult and airplanes as a time saver for ocean commuters and world tourists whose time is limited.

The principle of lighter-than-air flying is so fundamentally sound that men of great vision and foresight in the American navy have turned a deaf ear upon all the calamity howlers who have termed the dirigible a failure. The vast bulk of all the dirigible flying now being done in this country is being done by the navy.

The commercial possibilities of the helium-floated dirigible are beyond the imagination of the average man in the street. Yet the navy has virtually realized the success in this field it has long visualized.

The radio compass, and the system of radio compass stations that now dot our seacoasts are brain children of the navy that have saved innumerable human lives by snatching many a ship out of trouble among the reefs and shoals.

Floating dry docks, improvements in wharf and dock machinery in seaports throughout the world, improvements in ship hull design, better propelling machinery for ships, the de-salting of sea water for use aboard ships at sea, important chemical discoveries, the development of optical instruments, most of the advances made in the refrigeration of foodstuffs in ships, and important contributions to the sciences of medicine and surgery, are but a few additional things that the navy has done from which the entire nation has benefited.

The navy's annual contributions to the progress and development of industry would justify every penny it costs us for its maintenance at its peak of international treaty efficiency, even though its guns may never again be called upon to fire a hostile shot.

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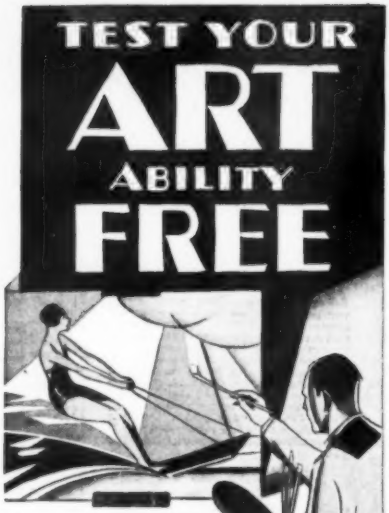

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Motor Mechanics

(Continued from page 162)

any accumulation of oil or dirt. Most starting motors are operated in oilless type bearings; however, if an oiler is provided, lubricate the bearings.

Check the alignment of the head lamps and see whether any lamp bulbs are burned out. See that the head lamps are properly focused and adjusted in order to prevent glare in the eyes of those you are passing.

The Chassis

Remove the transmission cover and the drain plug, draining the oil from the transmission and using kerosene to wash out or flush out the case. Check the gears for wear and check for end play of the shafts. Sometimes this is adjustable by means of shims under the bearing mounting flanges at the end of the case. Use a summer grade of lubricant to refill.

Remove the inspection plate and wash out the differential case of the rear axle. Sometimes incipient trouble with the ring gear mounting is discovered, that is, broken bolts or loose rivets. These should be replaced. Check the adjustment between the ring and pinion gear. There should be .006″ to .012″ play. Refill with the proper grade of lubricant. Use new gaskets.

Check the universals, remove old oil and refill with new. Check them for play. Sometimes it is necessary to replace bushings.

Check the clearance between the clutch pedal and the toe board. This should be not less than one inch and is usually adjustable. If the clutch has tended to slip, see your instruction book for methods of adjusting. Some clutches are adjustable, others are not. If all adjustment has been taken up on the clutch and it still slips, pull the transmission, pull the clutch and replace the clutch linings or facings.

The Steering Gear

Check the steering gear for play and adjust the thrust nut on the steering gear column to remove end play of the vertical steering gear shaft. Cross shaft end play is usually adjusted by means of shims or a screw and lock nut at the back of the case. See that the Pitman arm is tight on the splined or squared end of the cross shaft.

The steering gear action should be smooth. If not, open it up and inspect for broken thrust bearings. See that the steering gear is centered. That is, centered on high speed with the car wheels straight ahead. Old lubricant should be removed and new lubricant supplied. Use summer grade. Adjust the tie-rod and drag link ball and socket joints.

Check the front axle for toe-in of the wheels, which is ordinarily 0 to ⅛ inch. In a few cases it is more. Check the car action for caster of the spindle bolts or king pins. If not enough caster is supplied, the car tends to leave the road or wander. If too much, it may shimmy at low speeds. Wedges under the springs, either from front or rear will cure most troubles.

Check the camber of the front axle. Use a framing square placed against the outside of the wheel, checking to the spindle. The same should exist for each spindle body.

Motor Mechanics

Springs and Shock Absorbers

Check the spring mountings to front and rear axles, tightening the spring clips. Loose spring clips give rise to erratic car action and cause braking troubles.

Check the spring saddles and shackles for undue wear. In many cases these are adjustable, either by means of shims or castellated nuts. When working on the springs, check the car frame as you go and if loose rivets are found, knock them out with a cold chisel or punch and install short bolts with S.A.E. threads, locking them tight.

Check the shock absorbers for level of liquid in them, bringing it even with the filling plug. Set the control valve so that the proper action is secured for spring or summer time riding. Usually this means that the setting is turned in to give a more restricted valve opening, as the fluid is more active in summer.

Check the bumpers to see that they are in good condition and the mountings secure. Make repairs which may be necessary.

The Brakes

When going over the brakes, first check the condition of the lining. This may be possible without removing the wheels if a small inspection hole is provided in the drum. Otherwise remove the wheels and check for amount of lining remaining. It does not pay to run the lining until the last bit is worn away since drums may be scored. Set the shoes up to a free running fit.

In the case of hydraulic brakes, check the level of the solution in the supply cylinder and check the brake action. Look over the tube and hose connections. Replace any which appear defective. Check the pedal action to see that proper travel of the master cylinder is secured. Learn whether the system will "pump" up as this is essential to safety. If the pedal travel is too great, check the brake shoe setting. A two-inch movement of the pedal should give rather positive brake action.

In the case of mechanical brakes, check them for equalization. Go over the shoes, adjusting them to free running clearance. See that all parts of the rigging are lubricated where this is required and that the action is free and positive when the pedal returns to off position. Adjust the brakes until the positive action is secured with not more than two-thirds of the brake pedal travel.

The usual test on brakes is trying them on a straight, level road and observing the marks left by the tires. In the case of hydraulic brakes, all four wheels should slide at approximately the same time. In the case of mechanical brakes, some are designed to have a 60 per cent load on the rear wheels, and a 40 per cent on the front wheels, so that when the rear wheels slide, a heavy dark mark only is left by the front wheels.

Wheels and Tires

Check the condition of the tires and wheels. Front wheels should be adjusted on the bearings so as to have no undue play, while rear wheels should be drawn snug on the taper shaft to prevent wear and play.

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Test Your Ability as a Mechanic

(Continued from page 91)

The answers are as follows:

The maze test. Numbers in the columns at the right in Fig. 1 should read, from top to bottom. Example 1: 9, 4, 5, 1, 10, 8, 6 & 7, —, 2, 3. Example 2: 3 & 7, 8, 10, 2, 4, 6, —, 1, 5, 9. Example 3: 9, —, 3 & 10, 8, 7, 1, 4, 5, 2, 6. Example 4: —, 1, 3, 6, 5, 10, 8, 2 & 9, 4, 7.

Scoring. Allow 2½ points for each square numbered correctly. Thus, if you have correct numbers in 36 squares you have a score of 90. However, if the test is not finished in the time allowed, it is counted against the subject. Points are given only for correctly numbered squares.

The pulley problem. Problem 1: Direction of A, lower square; B, lower square; C, upper square; D, upper square. Speeds: Fastest. A; next, B; next, D; slowest, C.

Problem 2. Directions: A, upper square; B, lower square; C, lower square; D, lower square. Speeds: Fastest, D; next, C; next, B; slowest, A.

Problem 3. Directions: A, upper square; B, upper square; C, lower square; D, upper square. Speeds: Fastest, B; next, A; next, C; slowest, D.

Problem 4. Directions: A, lower square; B, lower square; C, lower square; D, lower square; E, upper square. Speeds: Fastest, C; next, E; next, D; next, B; slowest, A.

For each parentheses or square indicating direction and speed marked correctly, the subject gets 3⅓ points. Thus if 25 of the questions on speed or direction are marked correctly, the subject gets 83⅓, or 83. If point is more than half, a whole point is allowed.

The comparative size test. Problem 1: Biggest, D, C, B, E, F; smallest, A. Problem 2: Biggest, F, B, E, C, A; smallest, D. Problem 3: Biggest, E, D, B, F, A; smallest, C. Problem 4: Biggest, C, G, A, F, E, B; smallest, D.

In scoring, allow 4 points for each correct letter marked in the proper parentheses.

The completed figure test: Line 1, pieces 1 and 3 form complete figure; line 2, pieces 2 and 4; line 3, pieces 2 and 5; line 4, pieces 2 and 4; line 5, pieces 1 and 3; line 6, pieces 2 and 4; line 7, pieces 1 and 5; line 8, pieces 2 and 4; line 9, pieces 2 and 4; line 10, pieces 2 and 3.

Allow 10 points for each line marked correctly.

The adjacent block test. Group No. 1: Block A, 5; B, 6; C, 6; D, 7; E, 5. Group 2: A, 4; B, 3; C, 4; D, 6; E, 5. Group 3: Block A, 5; B, 5; C, 4; D, 4; E, 3. Group 4: Block A, 3; B, 2; C, 5; D, 4; E, 7. Group 5: Block A, 4; B, 5; C, 2; D, 3; E, 4.

Four points are allowed for each block marked with the correct number.

The copying test. In scoring this test, merely ascertain by careful inspection whether the lines are drawn to the proper dots and whether they have proper length and direction. Two points are given for each line that is correct.

The sorting test. In the box holding the screws the following numbers should be listed: 4, 12, 15, 17, 21, 26, 29, 33, 38, 41, 46, 51, 53, 58, 60, 65, 69, 74.

Nuts are as follows: 3, 5, 8, 10, 13, 19, 22, 25, 30, 34, 37, 42, 47, 50, 56, 62, 66, 70.

Washers: 2, 7, 9, 14, 18, 24, 27, 31, 36, 44, 48, 52, 55, 59, 63, 67, 71, 73.

Test Your Ability as a Mechanic

Bolts: 1, 6, 11, 16, 20, 23, 28, 32, 35, 39, 40, 43, 45, 49, 54, 57, 61, 64, 68, 72, 75.

One and one-third points are allowed for each article marked correctly in the spaces beneath the heads.

The dotting test: The score for this test is one and one-third times the number of dots placed clearly within the circles. Dots striking outside the circle of course are lost points.

Now comes the big job—determining the final score. After you have marked the grade for each test separately, add them all together, and divide the total by eight. This will give you your average grade.

With your grade determined, the final task is to learn your rating; that is, whether you possess high, medium or low mechanical ability. As previously mentioned, however, these tests are not infallible, but they give as accurate a measurement as science has so far been able to provide.

The letter ratings are set forth in the following table.

Grade	Rating
90 to 100	A—Superior
82 to 90	B—Above average
74 to 82	C—Average
68 to 74	D—Below average
63 to 68	E—Low ability
50 to 63	F—Slight ability

These interesting tests are briefed from the following extensive treatises on the subject: Detroit Mechanical Aptitudes Examination for Boys, published by the Public School Publishing Co., Bloomington, Illinois, and the MacQuarrie Test for Mechanical Ability, by T. W. MacQuarrie, Ph. D., University of Southern California, Los Angeles, Cal.

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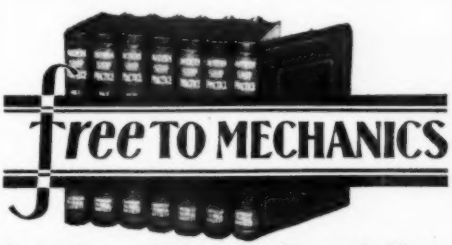

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Gasless Dirigible for Safe Air Travel

(Continued from page 109)

before we can do this, something very terrible happens to the tin ball.

When a certain and critical point is reached in the evacuation, an apparently invisible force crushes our tin can and it takes on an appearance very similar to a derby hat that has been sat upon by the heavy man from the circus. The atmospheric pressure on the outside of the can does this; a pressure that, in the case of a very high vacuum, reaches 14.7 pounds per square inch. So far, we do not have a very cheerful prospect.

Action of a Hollow Ball

But what would happen if we had a metal ball that would be able to withstand this pressure? The metal ball would float; it would have a great buoyancy, greater by far than it would have if it were filled with helium or hydrogen.

Of course, in assuming this, we must keep in mind the fact the metal ball would have to be very light and very strong. If we had a metal that would meet these specifications, we could have an all-metal, gasless air machine.

We cannot turn to aluminum or any of its alloys because they are too heavy. The thinnest and best steels are also ruled out but our search would eventually lead us to a comparatively unknown member of the metal family. It is called beryllium and we may expect many wonderful things of it.

Today beryllium is in the same commercial position that aluminum was in before the masterful researches of Charles Hall. But beryllium is a far more wonderful metal than aluminum; it has one-third the weight of aluminum and many times its tensil strength. It is hard, non-corrosive and one of the best behaved members of the whole metal family. Although it is not as plentiful in the earth's crust there are sufficient amounts of it to make its commercial use very alluring.

The beryllium air-machine may well be a combination vacuum and plane ship with the cubic capacity of the wings large enough to be a great factor in keeping the ship in the air.

Airplane Stability Aided

Such a development would tend to make airplanes more stable and only one-third the power would be necessary to drive them at high speeds. And that does not cover all of the advantages. Such ships could be so designed that even should the power plant fail, the vacuum compartments would be sufficiently large to permit the ship to settle gradually to earth, dropping with the grace and gentleness of a falling leaf.

In the design of such ships, it is logical to assume that the vacuum compartments would take on cellular form to prevent the ever-present atmosphere from crushing them. Some idea of this construction will be gained from the drawings which show the interior construction of a dirigible.

Let the metallurgists give us the cheap beryllium and we shall soon have the vacuum all metal planes and dirigibles. Engineers stand ready and willing to provide us with such luxuries of air travel; all they need is the necessary material.

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TELEVISION receiver built from a fan motor. Also a beginner's radio broadcast receiver which can be built for three dollars. Also the Robbins Long Distance low-power transmitter, just the thing for talking with fellow amateurs over great distances.

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WORKSHOP TOOLS—Toys—air rifle shooting gallery—diving helmet from a water heater—model boats—compressed air fire engine shoots real stream of water—duck decoys—electric eye opens garage door—and hundreds of others.

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If your news dealer is sold out, send 50 cents to Fawcett Publications, Inc., 529 S. Seventh St., Minneapolis, Minn., and a copy of the 1932 HOW TO BUILD IT will be sent you at once.

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Each article is written by an expert in his line, whether it's radio, boat design, or workshop practice.

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Text matter is simply written—no fol-de-rols; tells you all you want to know and then stops.

HOW TO BUILD IT has a stiff paper cover that will resist wear and tear in the workshop. The book is the same page size as Modern Mechanics and Inventions.

The news dealer from whom you bought this magazine will gladly let you examine a copy of the 1932 HOW TO BUILD IT—that's the best way to get a clear idea of the good cargo it contains.

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Big Pay in New Electrical Industry

(Continued from page 104)

Some day, of course, our colleges will recognize this young giant, but until they do, it is possible to receive very good training at radio schools.

And the salary? While much depends upon the individual, the writer would say that minimum salaries should run around $2,500 a year. They may reach as high as $10,000 for exceptional men who are able to save their employers a great deal of money by the application of electronic tubes and devices.

Electronic service men, naturally, cannot expect so much money for, after all, they are merely called upon to take care of something for which somebody else has been responsible. With this considered, the author does not see why a service man cannot demand a salary of $1,800 to $2,000 a year.

Looking forward to the time when large industries will have hundreds of electronic instruments in use, we can see where it will be necessary to have at least ten or fifteen electronic service men about a large factory.

We must not forget the genius in outlining the opportunities in this new art. He has the biggest chance of all. He will be the man who will help find many of the marvelous new applications that will be made in the coming years.

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Let them talk about radio, about television and the talkies, but the young man who can sense even dimly the storehouse of opportunity in this new field is the man of tomorrow.

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Blood Thirsty Creatures of the Deep

(Continued from page 121)

and the cockpit railing. It let out a hiss like the escape of exhaust steam from a small donkey engine. Then things happened, and how!

Its head is over the railing. Good Lord, it is going into the cockpit. The boy at the tiller strikes at its head with a boat hook. Misses. Hits the cockpit railing. The moray bites the boat hook and winds around it, going right down into the cockpit along the pole.

The boy and his dad jump on the after deck behind the tiller. Meanwhile I have crawled up front over the slippery, scaly deck, for if the boys are put overboard I must cast out an oar or life preserver.

But I still have the fish line in my hands. It is taut. The moray has gone as far as he can and I pull in dragging him back upon the forward deck. I can see his huge neck swelling in the movements of attempted respiration. Like a cat the barefooted fisherman is up after him with a great club and knife.

But while we have been occupied with the moray eel the boat has broached to and a great sea washes the creature overboard. The wave brings him back. He leaps again and we see it snarled in the line. The fisherman hits him a whale of a blow with a club. The moray leaps toward him but is brought up short by the line. The moray turns and bites himself savagely twice. This proves his death, for the fisherman pins him to the deck with the boat hook while his son brings the club into play.

But he continues to squirm for twenty minutes after his head is smashed flat.

"If that moray eel," said the fisherman in whose boat I was, "had gotten free of the line after he was pulled in the boat he would have either forced some of us into the sea or have gone overboard himself. I knew there was some dirty varmint down there when the yellow tails quit biting."

Some of the most formidable fishes run up to 2,000 to 4,000 lbs. weight. A big shark can swim at a rate of thirty or forty miles an hour and the peril of being attached to one, when in a small boat, is very great.

Owing to the fact that they seldom swim in a straight direction for a great distance there always is danger that the side pull on the boat, when they turn, may throw its occupants in the swirling tides.

The leopard shark is the most savage of the sharks in the American semi-tropics, the largest specimens reaching 24 feet in length. It becomes so bloodthirsty in the killing of fish that it will come right up to the boat to seize fish that are being drawn overside.

Its head is as big as a barrel and its jaws will cleave in two a 150-lb. sea turtle. In diabolical ferocity it has the attributes of the man-attacking barracuda.

At Bahia Honda Bay, in the Gulf of Mexico, half way between the Florida mainland and Key West, the winter fishing fleet hunts the Spanish mackerel schools at night with seines. Acetylene lamps are carried at the bow of each launch.

With a well-known fisherman, several years

Blood Thirsty Creatures of the Deep

ago, I was helping haul in the seine from a small skiff tied to the rear of the launch, when an immense mackerel shark almost leaped out of the water to seize the struggling mackerel that were gathered in the belly of the net. The cook jumped on the launch, seized a boat hook and the next time Mr. Shark came up gave him an ugly jab with its iron point.

The shark fled from the lighted water streaming blood. The fisherman jumped onto the launch to get his high-powered rifle, crying, "He'll be back." For old-timers in the fishing game know that while you can seldom induce a man-eating shark to attack by catching him on a shark hook, it's a different story when you stick a spear into him; he will then usually attack the first object he finds when he swirls to the surface.

The spotlight was cast over the water where the big fellow had disappeared. It made out his head. Sure enough, he was coming boiling along. The fisherman emptied the contents of his rifle into the shark.

The beast did not stop. It went under the skiff, seized the keel, and shook it as a terrier shakes a rat. The men were in terror lest they be cast out. But the steel-jacketed bullets had done their work. As the shaking ceased, swirls of water told of other cannibals coming to tear the bleeding victim to shreds.

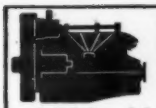
It is only in the last ten years that sailfish have been caught in quantities. The first sailfish officially recorded along the East Coast of Florida was landed off Palm Beach in 1901. Before that time fishermen did not apparently know where or how to catch them.

More and more of them are caught every year as fishermen become more adept in catching them, and they are caught every month in the year, though, of course, Northern people do most of their fishing for sailfishes, during the winter season from December to April.

The sailfish is a peculiar chap, a creature of moods, of a whimsicality that lends an element of constant surprise to his capture. Not always will he engage in his peculiar acrobatic feat of maintaining his equilibrium out of the water while progressing sideways. At times he will take everything in bait. Then, again, he will chase the bait ten or fifteen minutes and leave it.

He is a marvelous jumper. I am quite sure that he can throw himself across more than twenty feet of ocean. Once a friend saw a sailfish make thirty-two consecutive leaps. To behold our great Istiophor, rise from the waves in a surging mass of brine, and seem to hang suspended in the air for a moment at the top of his leap, far above the surface, enshrined in a rainbow of spray which matches the beautiful and elusive metallic tints that climb up the sides of his pearly throat, is indeed a magnificent spectacle.

A sturdy sailfish is capable of such continued effort that the crested giant has been known to "walk the water" for seventy-five feet or more. It is the strangest and most amazing of his "stunts," for by swift and powerful movements of his tail he raises his body well out of the sea as he propels himself over the waves.



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Fortune Making Ideas for Inventors

(Continued from page 85)

As matters now stand, the characteristics of dynamic speakers fluctuate with atmospheric conditions.

Specifications: Material or method used must be immune from moisture and heat so that acoustical properties will remain the same throughout the year.

Exploitation: Patent rights should be sold outright to the largest bidder among the manufacturers of radio components or complete sets.

3. Leak-Proof Bathing Cap

Here is another problem which should be worth a cool million to the lucky man who solves it. How many of our wives or sisters have complained, upon coming out of the water, that their bathing caps did not keep their hair dry? And who has ever seen a water-tight bathing cap?

Specifications: Cannot be large or bulky and must be sold with a guarantee to keep water out of the hair. Should not add much to the cost of making bathing caps, the limit an increase in the retail price of twenty-five cents.

Exploitation: Should be patented in all civilized countries and should be sold with a large down payment against royalty. The royalty should run about three cents a cap.

4. Moth-Proof Felt for Pianos

One of the first things that a professional inventor should do is to develop the faculty of keeping his eyes open and looking about him at the many crude devices that we use every day in this comparatively crude civilization of which we are a part.

Only the other day, I had to call in a piano repairman to have him replace some felt in my piano which had been destroyed by moths. This little job cost me a pretty penny and set me to wondering why it was necessary to use this material? It seems to me that we have never used any other material for this purpose because no inventor has ever set about to find one.

Specifications: Like everything else, it should be inexpensive, even cheaper than the felt now used. Should also be practically impervious to moisture and heat. Ageing should also be able to effect but little change in the material.

Exploitation: Should be patented in all of the leading countries of the world and should be licensed for use by the principal piano makers.

5. Paper Boxes for Department Stores

Any department store owner will tell you that a new and more attractive form of collapsible card-board box is needed in trade.

What is desired is a beautiful box that may be quickly and securely assembled by the clerk in charge of the sale. Perhaps it might be done with a simple machine, but the ideal solution to the problem would be the perfection of a new type of box that could be put together quickly and without the use of mucilage.

Little or no evidence of a joint should be discernible and the box should have the same neat appearance as boxes now in use.

Fortune Making Ideas for Inventors

Specifications: Boxes should be just as attractive as boxes now in use and the cost should not be any greater.

Exploitation: Should be patented in this and in foreign countries. The inventor should ask for royalty, that is, a certain amount on every thousand boxes made by those who take out licenses.

6. *Panoramic Camera and Kodak*

Every amateur photographer would like to be able to take panoramic pictures with an ordinary kodak. Cameras made especially for this purpose are very expensive and quite beyond the modest means of the average photographic enthusiast.

Then why not a cheap attachment that could be applied to an ordinary kodak and tripod? I have had this problem in mind for a number of years and often promised myself that I should look into the matter and see what could be done.

However, the pressure of other matters has always interfered and so I am going to turn the idea, naked and unfinished, over to my readers with the fond hope that some ingenious fellow will find a solution and make millions of amateur photographers happy with a new and very useful toy.

But please don't write and ask me how a panoramic camera works. Use your own head and go to the library and get a book on photography.

Specifications: This device may sell for as high as seven to eight dollars, although a flat five would be a better price for it. It should be able to cover 180 degrees. By this, I mean that it should be able to turn 180 degrees on the tripod and photograph everything within this range. Should be very simple and capable of being used by a very inexperienced person.

Exploitation: Should be sold outright to some large manufacturer for about $25,000. Is that enough?

7. *Device to Locate Burned-Out Tree Bulbs*

Those who have fussed about trying to find a defective bulb in a chain of Christmas tree lights know what a really annoying quest this can be. It invariably happens that it is the last light examined that has blown out.

All of which suggests the perfectly obvious question: Why not have an indicator on each socket that would tell the dead-bulb hunter just where the trouble lies? Fine, but how are you going to do it, you ask.

But I am asking you and therein lies a nice and neat little problem, the solution of which will bring a great deal of real money to its originator.

Specifications: Must be able to pass the Underwriters' rules on fire prevention. Must not add over one dollar to the cost of each string of lights and should be very visible.

Exploitation: Owing to the fact that this sort of Christmas tree ornaments are used only in this country, the patent should be confined to the United States.

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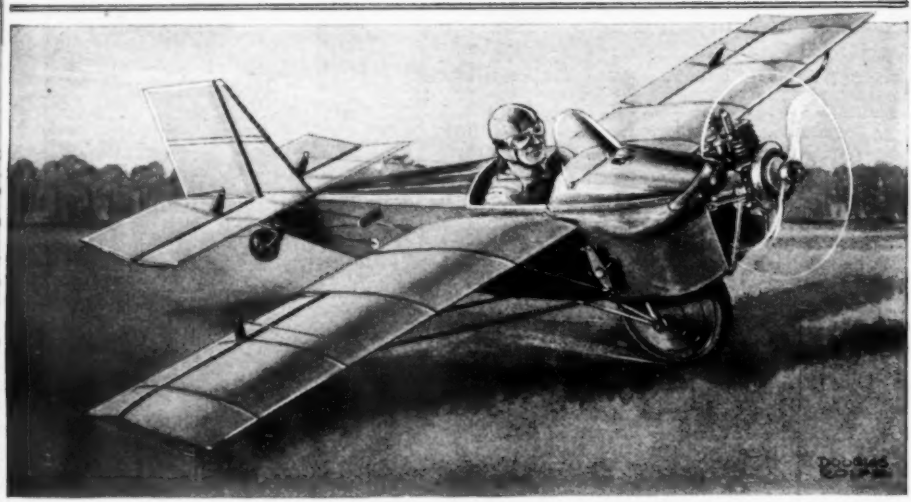

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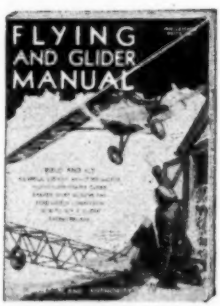

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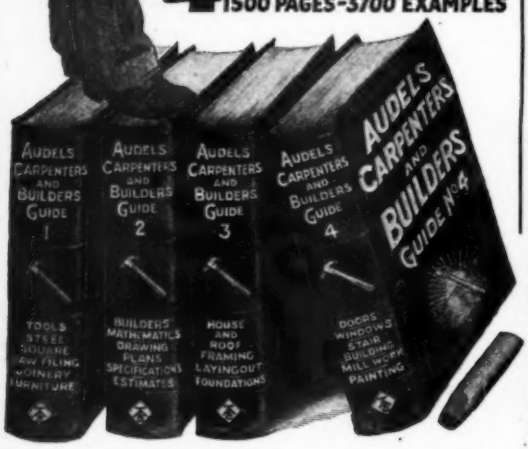
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Amazing Magic Disc Boils Water *Almost Instantly!*

AND PAYS AGENTS UP TO $20..$30..$40 IN A DAY

AT LAST the good news is out! The new Super-Lux Double-Action Water Heater is ready! Now hot water—boiling, steaming, hot in less time than ever before! Even the amazing 1931 Lux has been surpassed by this new scientific marvel. Five major improvements and many minor refinements put this sensational device absolutely in a class by itself—miles ahead of any similar heater money can buy.

5 Amazing Improvements!

First of all (1) the new Super-Lux sets a new standard for appearance with a flashing super-polished outer shell that is useful as well as ornamental. By an exclusive new process, the material plated on actually becomes a part of the metal and protects it against pitting, scarring and corrosion. (2) An improved cord with extra heavy wires makes overheating impossible and a special insulation that will not soften or crack in hot water. (3) Instead of bronze or copper screws and fittings, the new Lux uses a special alloy that will not corrode or turn green; water heated with it can safely be used for cooking. (4) The heating element, too, is made heavier and of a new material that adds months, even years, to the useful life of the heater.

Most important of all, is (5) the amazing double-action heating principle—an exclusive Super-Lux feature! Makes possible hitherto unobtainable speed and efficiency. Simply drop the new Super-Lux in a pan of water, turn on the current and, almost instantly the water is seething, bubbling, boiling furiously. You simply have to see it in action to realize its volcanic intensity and speed of action. And, remember, the only way to enjoy all these advantages is to own the new Super-Lux. No matter how much or how little hot water you use, you need this amazing invention!

$195.00 IN TEN DAYS

How would you like to make $195 in 10 days? C. L. Neuman (Ind.) has shown that it can be done. Read what he says: "Have sold 158 (made $195) in 10 days. No trouble to sell them!" But Neuman is only one of many who find sensationally big profits amazingly easy to make. Send the coupon below for free proof of extraordinary opportunity.

$41.25 in One Day

Still another sensational achievement. J. Smith (Mo.) earned $41.25 in one day with the Lux Water Heater! Your territory is just as promising as Smith's or any other. So, don't fail to mail the coupon TODAY!

Triples Profits for Agents

Why not investigate today—read what it will do. More important still, look into its astounding money earning power. Learn why men who never made more than $10 or $12 in a day before now reach $20—$30—$40 or more with ease! No experience or special sales ability needed—a simple 60-second demonstration is all it takes, for people know the name LUX—know this company as the pioneer manufacturers of this type of heater—know that the name means quality—service—VALUE! An improved Lux, therefore, all but sells itself. Investigate NOW!

MAIL COUPON TODAY

For Description of the New Super-Lux and amazing proof of sensational big money opportunity!

LUX-VISEL, Inc., Dept. D-150,
Elkhart, Indiana.

Rush me full information about the New Super-Lux and amazing BIG-MONEY opportunity.

Name .....

Address .....

City ..... State .....

LUX-VISEL, Inc.
Dept. D-150
ELKHART, INDIANA